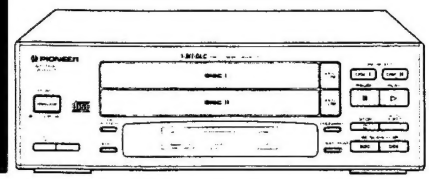
PIONEER®
The Art of Entertainment

Service Manual



ORDER NO.
ARP2174

TWIN-TRAY COMPACT DISC PLAYER

PD-P710T

- **This manual is applicable to the PD-P710T/AEBMD type.**
- **This product is a component of systems.**
  As to the system composition, refer to the system manuals.
- **This product does not function properly when independent; to avoid malfunctions, be sure to connect it to the prescribed system component (s), otherwise damage may result.**
- **This product receives an AC voltage generated from the transformer's secondary winding in other component.**
- **Mechanism section of this product is same as PD-Z74T except for some parts. As to the mechanism description, refer to SERVICE GUIDE ARP2144, PD-Z74T.**
- **Ce manuel pour le service comprend les explications de réglage en français.**
- **Este manual de servicio trata del método ajuste escrito en español.**

CONTENTS

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SQ FEB. 1991 Printed in Japan

1. SAFETY INFORMATION

(FOR EUROPEAN MODEL ONLY)

VARO!
AVATTAESSA JA SUOJALUKITUS OHITETTAESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN.

ADVERSEL:
USYNLIG LASERSTRÅLING VED ÅBNING NÅR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION UNDGÅ UDSAETTELSE FOR STRÅLING.

VARNING!
OSYNLIG LASERSTRÅLNING NÄR DENNA DEL ÄR ÖPPNAD OCH SPÄRREN ÄR URKOPPLAD. BETRAKTA EJ STRÅLEN.

LASER
Kuva 1
Lasersateilyn varoitusmerkki

WARNING!
DEVICE INCLUDES LASER DIODE WHICH EMITS INVISIBLE INFRARED RADIATION WHICH IS DANGEROUS TO EYES. THERE IS A WARNING SIGN ACCORDING TO PICTURE 1 INSIDE THE DEVICE CLOSE TO THE LASER DIODE.

IMPORTANT
THIS PIONEER APPARATUS CONTAINS LASER OF HIGHER CLASS THAN 1. SERVICING OPERATION OF THE APPARATUS SHOULD BE DONE BY A SPECIALLY INSTRUCTED PERSON.

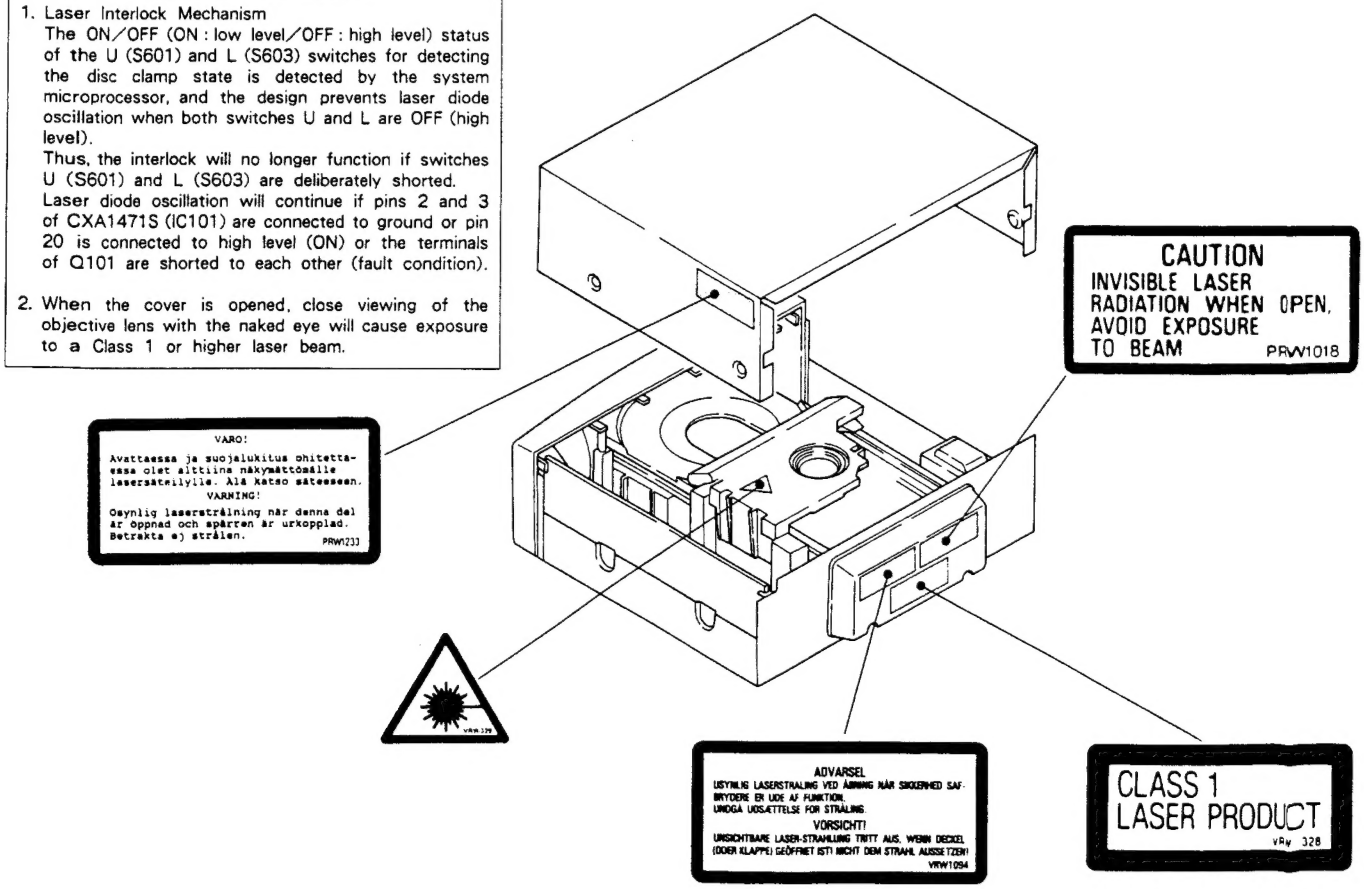
LASER DIODE CHARACTERISTICS
MAXIMUM OUTPUT POWER: 5 mw
WAVELENGTH: 780-785 nm

LASER
Picture 1
Warning sign for laser radiation

LABEL CHECK (TWIN type)

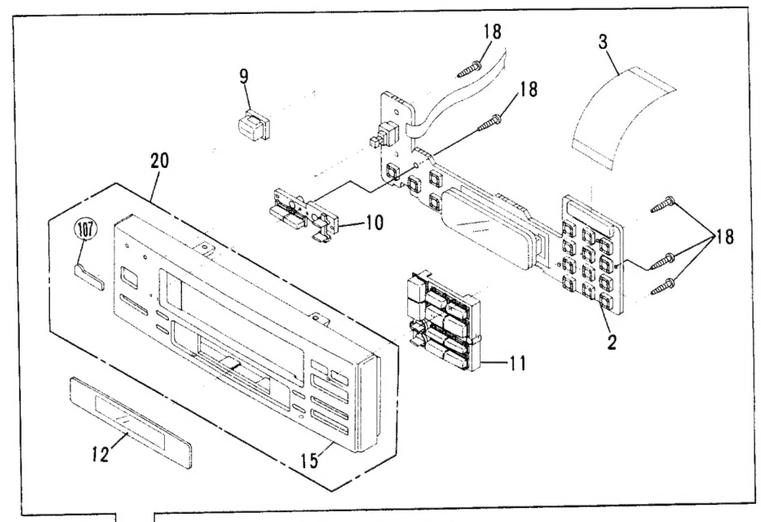
Additional Laser Caution

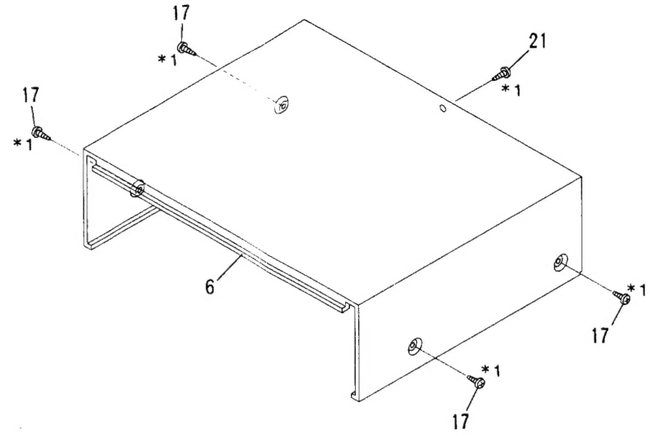
1. Laser Interlock Mechanism
   The ON/OFF (ON : low level/OFF : high level) status of the U (S601) and L (S603) switches for detecting the disc clamp state is detected by the system microprocessor, and the design prevents laser diode oscillation when both switches U and L are OFF (high level).
   Thus, the interlock will no longer function if switches U (S601) and L (S603) are deliberately shorted.
   Laser diode oscillation will continue if pins 2 and 3 of CXA1471S (IC101) are connected to ground or pin 20 is connected to high level (ON) or the terminals of Q101 are shorted to each other (fault condition).
2. When the cover is opened, close viewing of the objective lens with the naked eye will cause exposure to a Class 1 or higher laser beam.

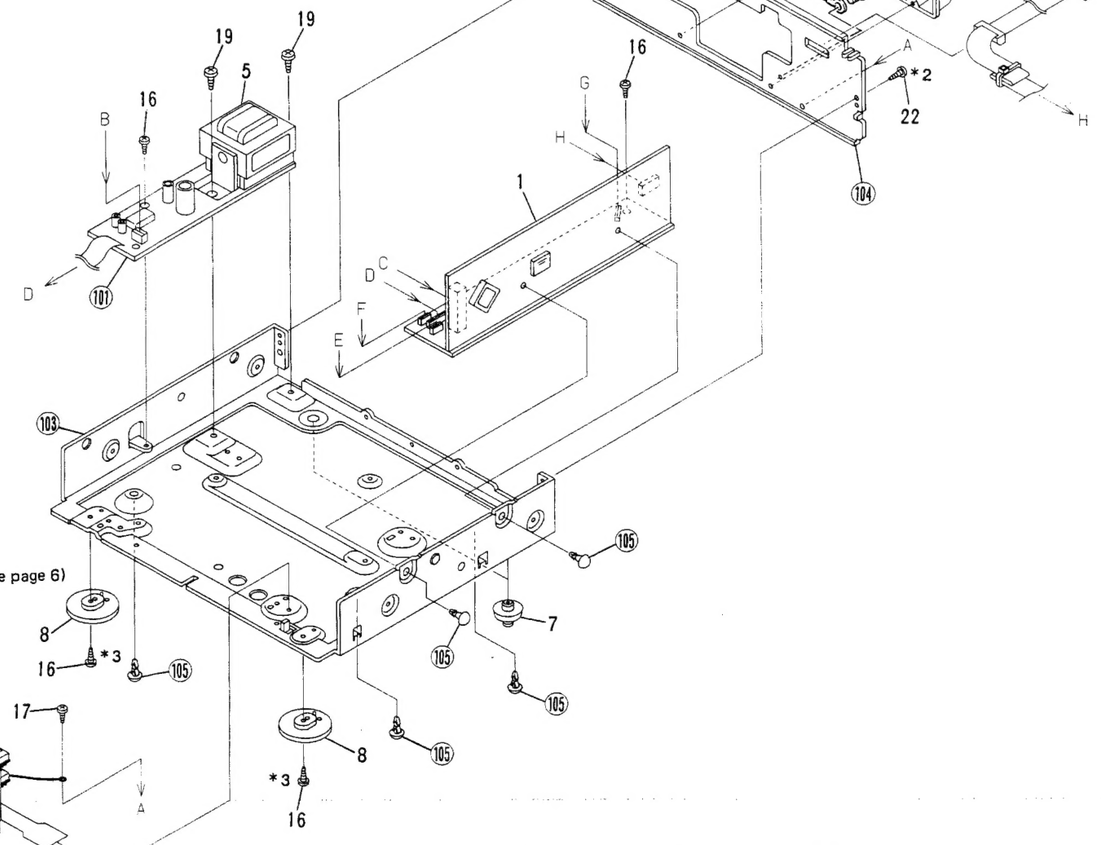


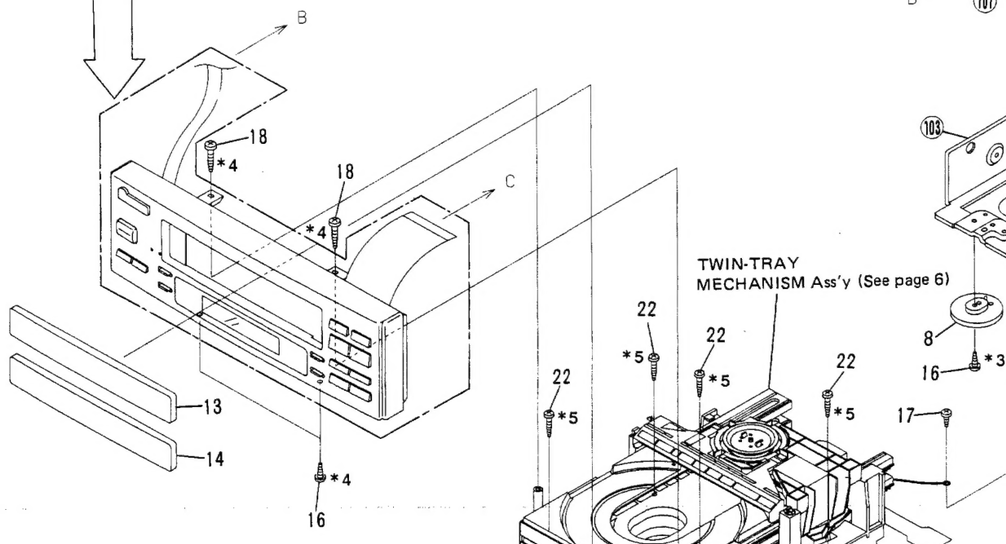
2. EXPLODED VIEWS AND PARTS LIST

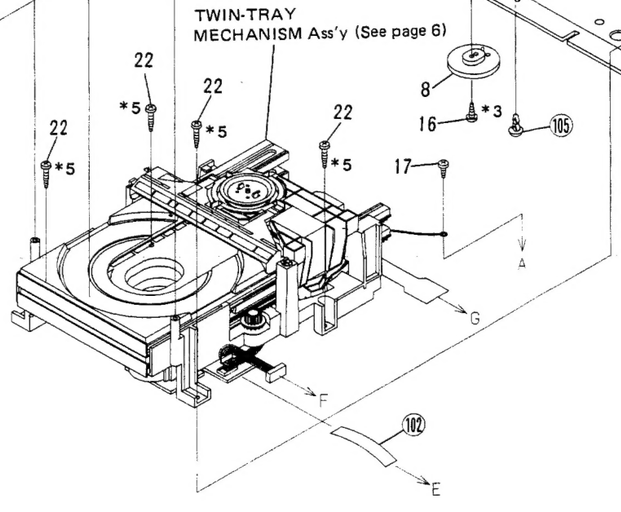
2.1 EXTERIOR











Note: The numbers such as * 1 through * 5 are used in "4. DISASSEMBLY".

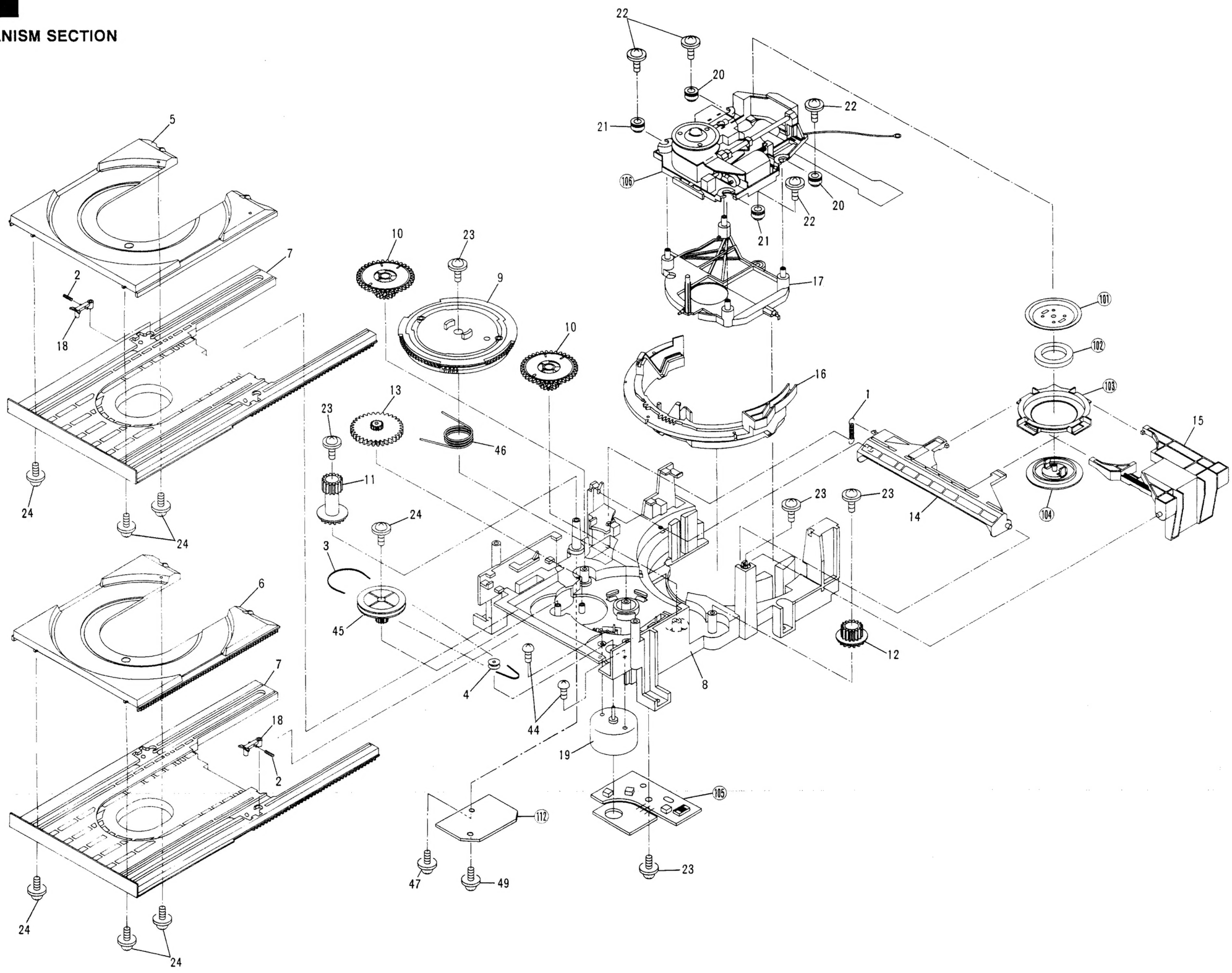
NOTES:

- Parts without part number cannot be supplied.
- The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- Parts marked by "⊙" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.

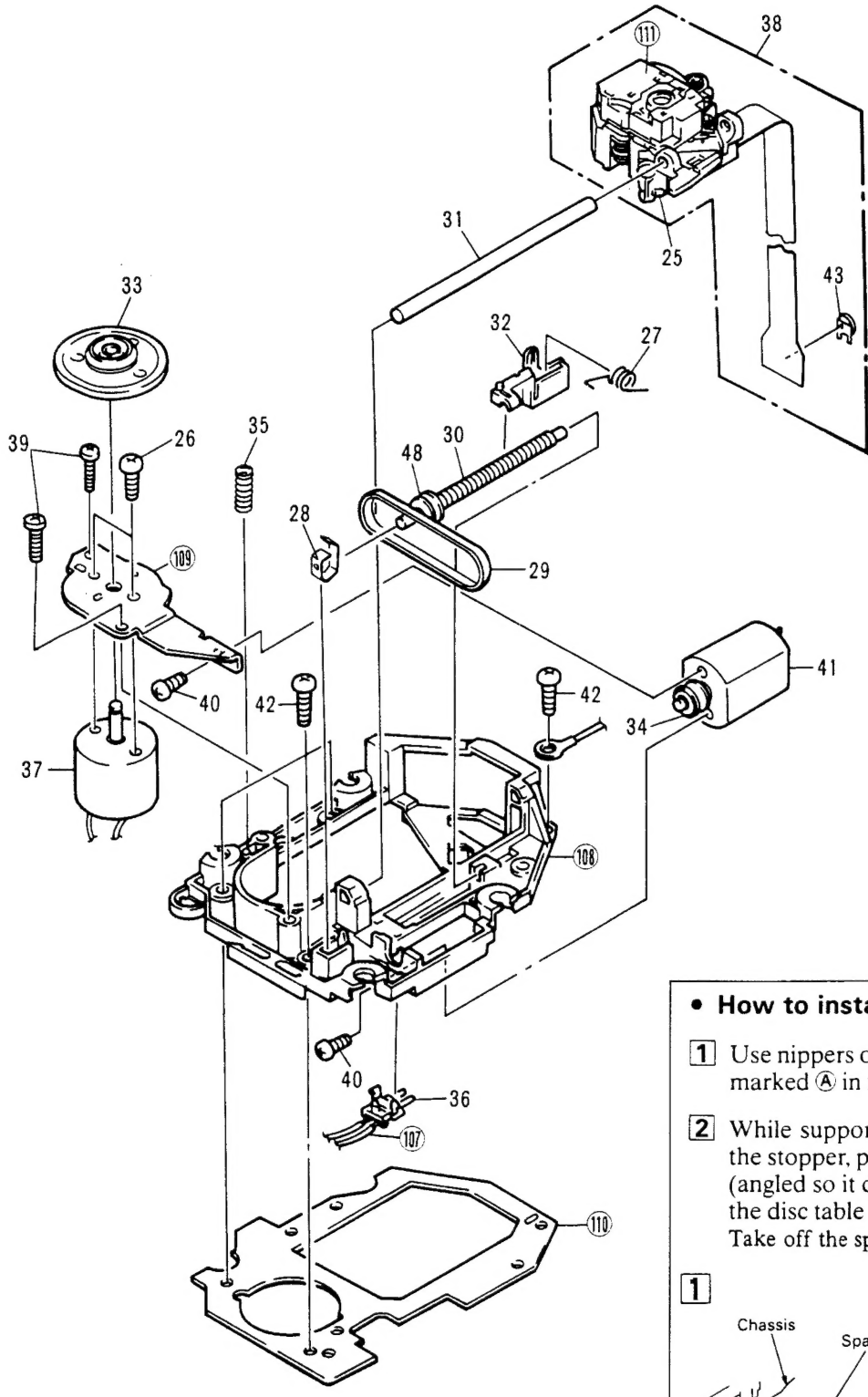
Parts List

Mark	No.	Symbol & Description	Part No.
⊙	1	Mother board assembly	PWM1376
⊙	2	Display board assembly	PWZ2016
	3	25P F・F・C/30V	PDD1067
	4	Cord with connector	PDE1107
⚠	5	Power transformer	PTT1169
	6	Bonnet	PNA1528
	7	Foot	REC − 434
	8	Insulator assembly	RXA1344
	9	Power button	PAC1519
	10	Mode button	PAC1520
	11	Operate button	PAC1568
	12	Display window	PAM1485
	13	Name plate 1	PNW1945
	14	Name plate 2	PNW1946
	15	Function panel	PNW1947
	16	Screw	BBZ30P060FZK
	17	Screw	BDZ30P060FZK
	18	Screw	BBZ30P120FMC
	19	Screw	PSA40P080FZB
	20	Function panel unit	PEA1131
	21	Screw	BBZ30T080FZK
	22	Screw	BBZ30P080FZK
	101	Power board assembly	
	102	Jumper wire	
	103	Under base	
	104	Rear base	
	105	PCB holder	
	106	Rear cap	
	107	Name plate	

2.2 MECHANISM SECTION



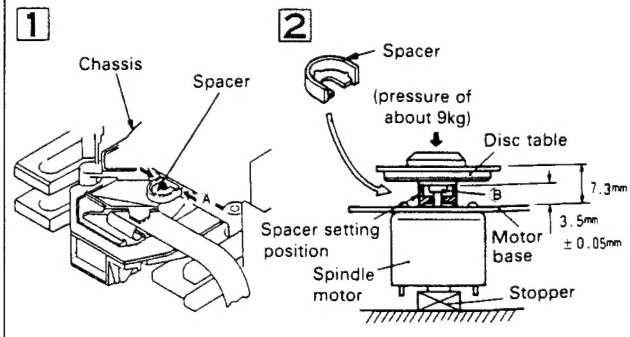
● Servo Mechanism Assembly Section



• How to install the disc table

1 Use nippers or other tool to cut the two sections marked Ⓐ in figure 1. Then remove the spacer.

2 While supporting the spindle motor shaft with the stopper, put spacer on top of the motor base (angled so it doesn't touch section Ⓑ), and stick the disc table on top (takes about 9kg pressure). Take off the spacer.



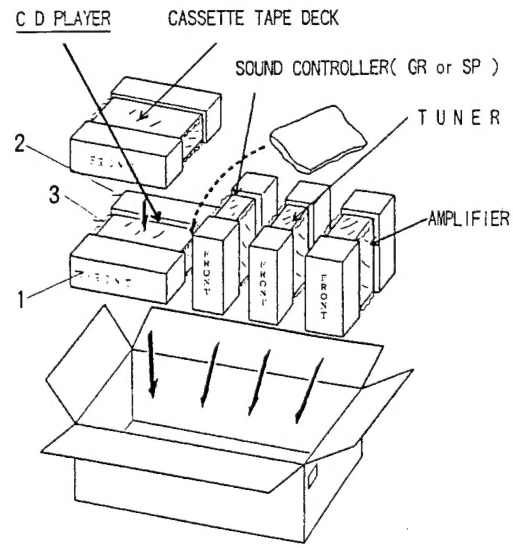
Parts List of Mechanism Section

Mark	No.	Symbol & Description	Part No.
	1	Clamp spring	PBH1103
	2	Lever spring	PBH1104
	3	Belt	PEB1106
	4	Motor pulley	PNW1634
	5	Tray 1	PNW1986
	6	Tray 2	PNW1987
	7	Sub tray	PNW1985
	8	Loading base	PNW1842
	9	Main cam	PNW1843
	10	Follow gear	PNW1844
	11	Gear 1	PNW1845
	12	Gear 2	PNW1846
	13	Idler gear	PNW1847
	14	Clamper arm U	PNW1850
	15	Clamper arm B	PNW1851
	16	Clamp cam	PNW1852
	17	Float base	PNW1853
	18	Lock lever	PNW1854
	19	Motor (LOADING)	PXM1010
	20	Floating rubber	PEB1014
	21	Floating rubber	PEB1132
	22	Screw	PBA1048
	23	Screw	IPZ30P080FMC
	24	Screw	IPZ20P080FMC
	25	Chip capacitor	CKSYF105Z16
	26	Screw	JFZ20P025FMC
	27	Drive spring	PBH1084
	28	Plate spring	PBK1057
	29	Belt	PEB1072
	30	Drive screw	PLA1003
	31	Guide bar	PLA1071
	32	Half nut	PNW1605
	33	Disc table	PNW1608
	34	Pulley	PNW1634
	35	Earth spring	PBH1009
	36	Push switch	DSG1014
	37	Spindle motor assembly (with oil)	PEA1028
	38	Pick – up assembly	PEA1030
	39	Screw	BPZ20P080FZK
	40	Screw	PMZ20P030FMC
	41	Motor (CARRIAGE)	PXM1013
	42	Screw	PBZ30P080FMC
	43	Semi – fixed resistor	PCP1008
	44	Screw	PMZ26P040FMC
	45	Gear pulley	PNW1848
	46	Push spring	PBH1105
	47	Screw	IPZ30P200FMC
	48	Pulley	PNW1066
	49	Screw	IBZ30P120FMC
	101	Yoke	
	102	Magnet	
	103	Clamper holder	
	104	Clamper S	
	105	Mechanism P.C.B assembly	
	106	Servo mechanism assembly	
	107	Connector assembly (6P)	
	108	Mechanism chassis	
	109	Motor base	
	110	Mechanism base	
	111	Actuater cover	
	112	Sub plate	

3. PACKING

Parts List

Mark	No.	Symbol & Description	Part No.
	1	Protector F	PHA1132
	2	Protector R	PHA1133
	3	Mirror mat sheet	Z23 – 026



4. DISASSEMBLY

4.1 REMOVING THE MOTHER BOARD ASSEMBLY

- Refer to "2.1 EXPLODED VIEWS" on page 3 and 4.
  ····(screws of *1 to *5)

(1) Remove the bonnet by removing five *1 screws.

(2) Insert your fingers between the twin-tray mechanism assembly and under base (See Fig. 4-1) and open the tray 1 and 2 by turning the idler gear, then remove the name plate. (This is the preparation for removing the front panel.)
- For the tray 1, turn the idler gear clockwise. For the tray 2, turn the idler gear counterclockwise.

  Note: Be careful not to break the claws at the bottom of the name plate, since they are fragile.

(3) Remove the rear base by removing four *2 screws, insulator assembly by removing two *3 screws and front panel by removing four *4 screws.

(4) Remove the four *5 screws fastening the twin-tray mechanism assembly. Slightly move the twin-tray mechanism assembly to the power board assembly so that the mother board assembly is easy to remove.

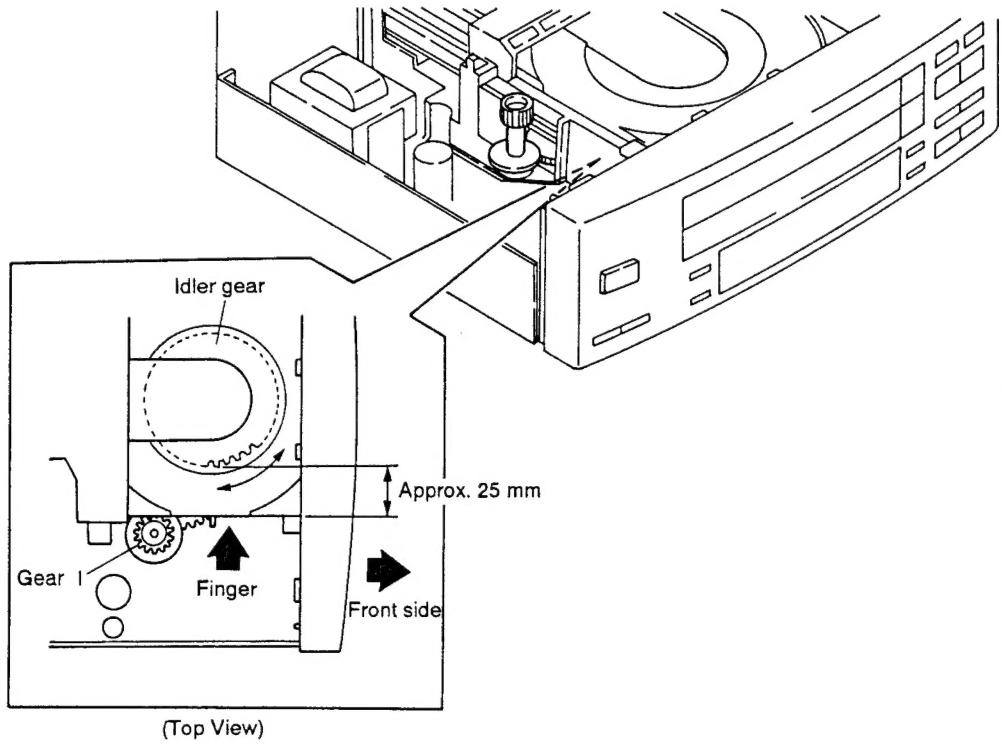
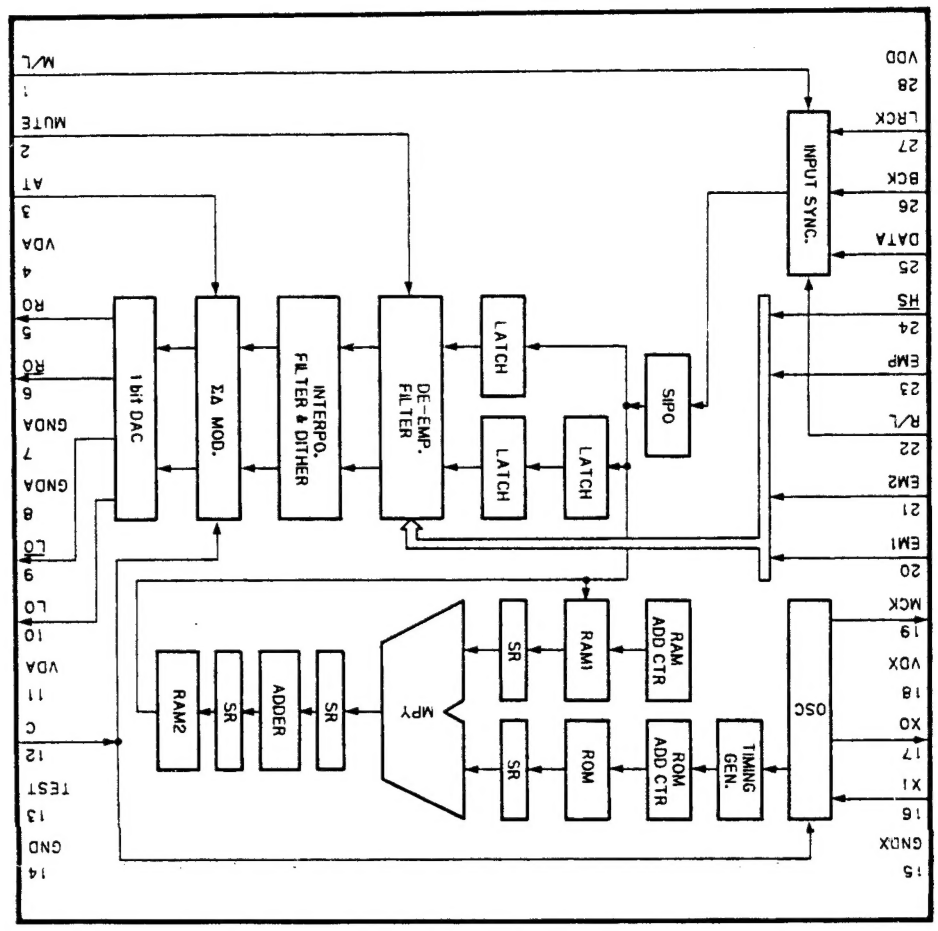


Fig. 4-1



TC9237F

(5) Remove the clamper clamping the flexible cable, comes from the pick-up assembly, on the mother board assembly. (See Fig. 4–2 Ⓐ.)

(6) Remove the screw fastening the mother board assembly. (See Fig. 4–2 Ⓑ.)

(7) Remove the mother board assembly from the PCB holder ① and ②, then pull out. (See Fig. 4–2 ① and ②.)
After removing the mother board assembly from the PCB holder ① and ②, slightly move the board not so as to be held by the PCB holder. Or remove the PCB holder ① from the under base (chassis).

Note: The mother board assembly is a L–shaped board consisting of two boards connected with jumper wire (See Fig. 4–3). Do not bend the jumper wire or applying excessive force on one point when extracting or installing. This may result in broken jumper wire or peeled pattern.

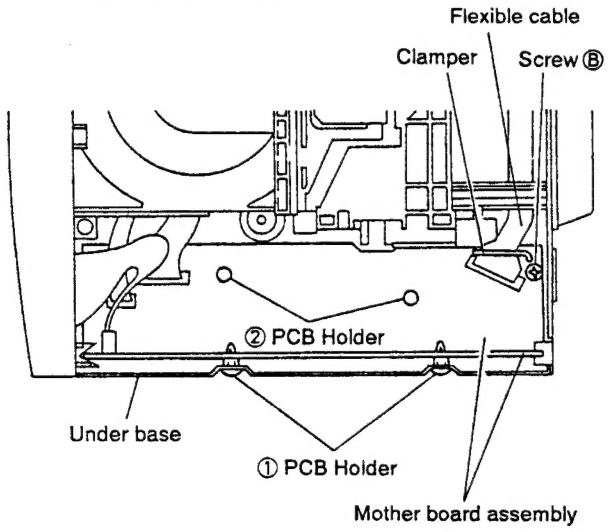
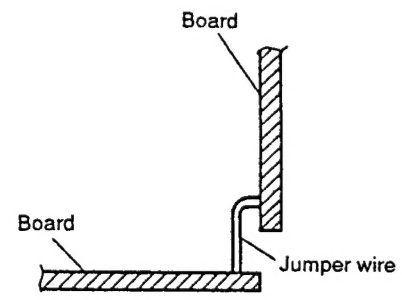


Fig. 4–2



Mother board assembly cross section

Fig. 4–3

(8) When checking the board, tape the mother board assembly on the clamper base.

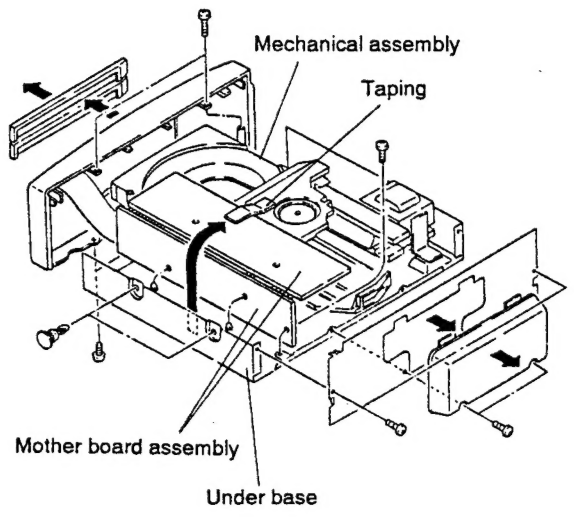
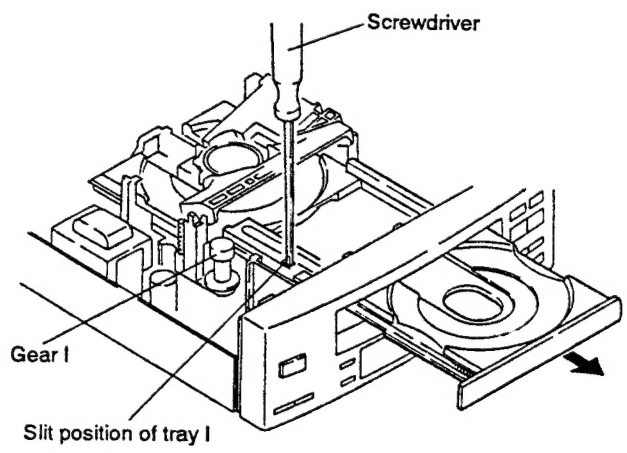


Fig. 4–4

4.2 REMOVAL OF TRAY I AND TRAY II

(1) Open the tray I.

(2) Insert the flat blade screwdriver into the slit in the left of tray I. Pull out the tray I by pushing the screwdriver.



* When remove the tray II, open it first, insert the flat blade screwdriver into the slit in the right of tray II, and pull out the tray by pushing the screwdriver.

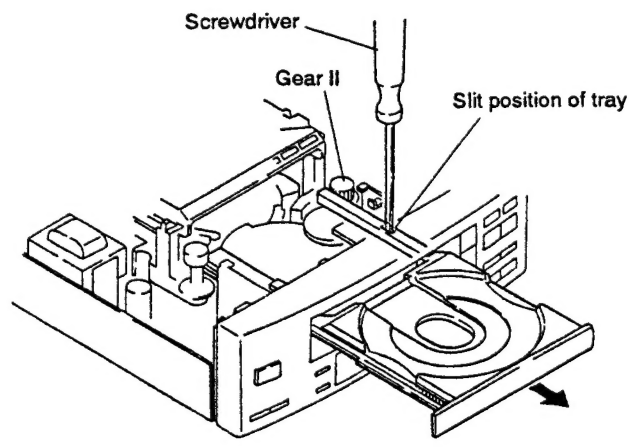


Fig. 4–5

CXA1372Q

CXA1471S

CXD2500Q

4.3 MOUNTING OF TRAY I

(1) Set the disc II to the clamp position and open the tray I.
(2) Align the 1st tooth of tray I to ungrooved portion of gear I, and insert the tray I.

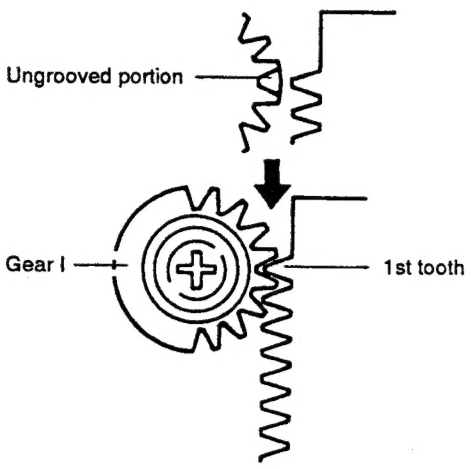


Fig. 4–6

4.4 MOUNTING OF TRAY II

(1) Set the disc I to the clamp position and open the tray II.
(2) Align the 1st tooth of tray II to □ marked position of gear II, and insert the tray II.

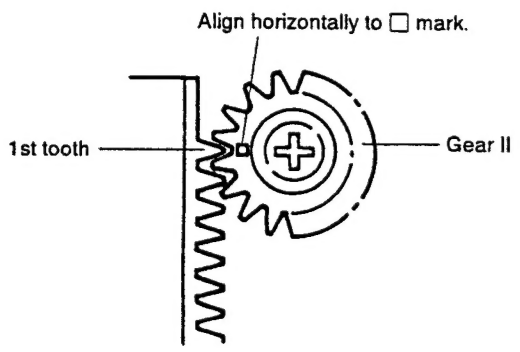


Fig. 4–7

4.5 MOUNTING AND POSITIONING OF MAIN CAM, FOLLOW GEAR, GEAR I AND GEAR II

Set the following gears to the position as shown by arrows.

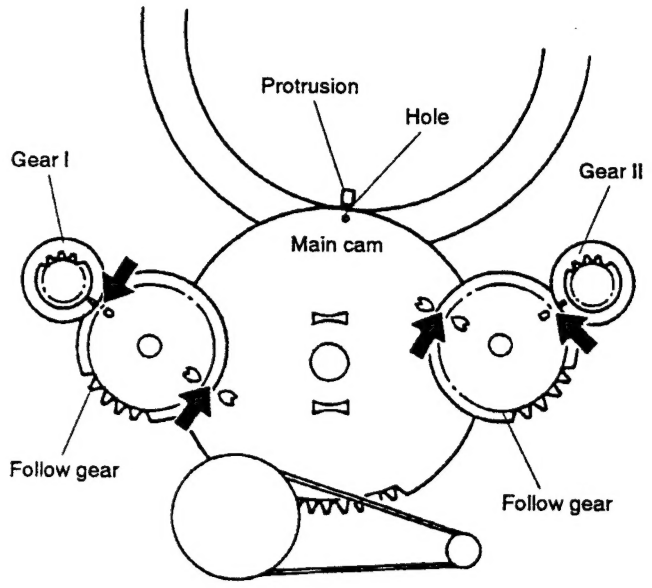


Fig. 4–8

4.6 MOUNTING OF CLAMPER ASSEMBLY

Mount the clamper assembly by aligning the protrusion portion as shown in the figure.

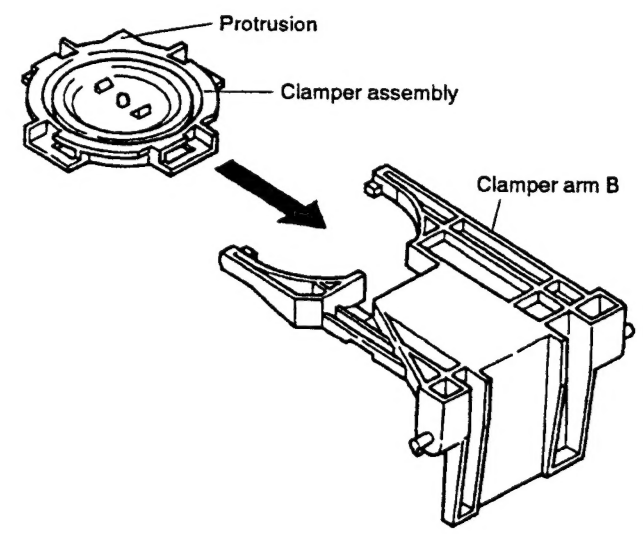


Fig. 4–9

5. SCHEMATIC DIAGRAM

Focus servo loop
Signal route
Tracking servo loop
Carriage servo loop
Loading motor route
Spindle motor route
Measurement Point

IC404 (1/2)
NJM4558D-D (LOW PASS FILTER)

IC404 (2/2)
NJM4558D-D
(LOW PASS FILTER)

IC401 : DIGITAL FILTER & D/A CONVERTER
IC401 TC9237F
(16.9344MHz) X401 PSS1008

IC351 PD4309B (SYSTEM CONTROL)
(4.19MHz) VSS1014 X351

IC20 M5298P (IC20 SYSTEM RESET& ±5V REGULATOR)

POWER BOARD ASS' Y

TO AMP (A-P510 or A-P710)
CN381
CN11
CN12
J11
J702

Q404 2SD2144S (MUTE)
Q403 2SD2144S (MUTE)
Q405 DTC124S (MUTE DRIVE)
Q381 2SC1740S (BUFFER)
Q382 2SC1740S (BUFFER)
Q62 REGULATOR ON/OFF

D381 1SS254
D382 1SS254
D383 1SS254
D54 MTZJ188
D11 D12 D13 D14 11ES2×4
D52 11ES2

POWER TRNSFORMER PTT1169

1. RESISTORS :
   Indicated in Ω, 1/6W, ±5% tolerance unless otherwise noted k ; kΩ, M ; MΩ, (F) ; ±1%, (G) ; ±2%, (K) ; ±10%, (M) ; ±20% tolerance.

2. CAPACITORS :
   Indicated in capacity (μF) / voltage (V) unless otherwise noted p ; pF.
   Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE CURRENT :
   ; DC voltage (V) at play state.
   ⬅mA ; DC current at play state.
   Value in ( ) is DC current at stop state.

4. OTHERS :
   ➡ ; Signal route.
   ⊘ ; Adjusting point.
   The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
   ※ marked capacitors and resistors have parts numbers.

   This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

5. SWITCHES (Underline indicates switch position)
   S701 : ▶▶/▶▶|
   S702 : COMPU PGM
   S703 : PROGRAM
   S704 : |◀◀/◀◀
   S705 : PLAY
   S707 : REPEAT
   S708 : AUTO EJECT
   S709 : HI – LITE SCAN
   S710 : RANDOM PLAY
   S711 : STOP
   S712 : PAUSE
   S713 : OPEN/CLOSE (DISC I)
   S714 : OPEN/CLOSE (DISC II)
   S715 : DISC1
   S716 : DISC2
   S717 : TIME/CALENDAR
   S751 : POWER ON – OFF

List of semiconductor terminal voltage

Note: All terminal voltages are measured in the PLAY mode.

IC151 (CXA1372Q)

Pin No.	Volts	Pin No.	Volts
1	0.0	25	5.0
2	0.0	26	0.0
3	0.0	27	5.0
4	0.0	28	0.0
5	0.2	29	0.0
6	0.0	30	NC
7	0.2	31	2.5
8	0.0	32	2.5
9	0.0	33	5.0
10	5.0	34	−1.5
11	0.0	35	−1.7
12	0.0	36	5.0
13	0.0	37	−0.7
14	0.2~0.8	38	−1.6
15	0.0	39	0.0
16	−4.0	40	0.8
17	1.3	41	−5.0
18	0.0	42	0.0
19	−5.0	43	0.0
20	5.0	44	0.0
21	5.0	45	0.0
22	5.0	46	0.0
23	5.0	47	0.0
24	5.0	48	0.0

IC20 (M5298P)

Pin No.	Volts
1	−9.4
2	NC
3	−5.0
4	0.0
5	−9.4
6	NC
7	NC
8	NC
9	5.0
10	NC
11	0.7
12	5.0
13	8.6
14	5.0
15	1.2
16	8.6

IC301 (CXD2500Q)

Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts
1	5.0	21	0.0	41	NC	61	NC
2	NC	22	2.5	42	5.0	62	NC
3	5.0	23	5.0	43	NC	63	0.0
4	2.6	24	2.5	44	NC	64	NC
5	NC	25	NC	45	NC	65	0.0
6	5.0	26	0.0	46	4.4	66	3.3 ~4.6
7	NC	27	2.5	47	0.0	67	5.0
8	NC	28	0.0	48	0.0	68	0.0
9	0.0	29	NC	49	0.0 ~0.3	69	2.1 ~3.0
10	0.0	30	0.0	50	NC	70	5.0
11	NC	31	NC	51	NC	71	5.0
12	0.0	32	2.5	52	0.0	72	5.0
13	NC	33	5.0	53	2.5	73	5.0
14	NC	34	2.5	54	NC	74	5.0
15	NC	35	2.5	55	0.0	75	5.0
16	NC	36	NC	56	NC	76	0.0
17	0.0	37	NC	57	NC	77	5.0
18	2.5	38	NC	58	NC	78	5.0
19	2.4	39	NC	59	0.0	79	5.0
20	2.4	40	NC	60	NC	80	0.0

IC351 (PD4309B)

Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts
1	5.0	17	−12.8	33	4.9	49	0.0
2	−24.7	18	−27.7	34	3.0 ~ 4.0	50	0.0
3	−24.7	19	−5.0	35	4.9	51	5.0
4	−24.7	20	−9.7	36	0.0	52	5.0
5	−24.7	21	−12.7	37	5.0	53	5.0
6	−24.7	22	-0.2~-3.0	38	2.5	54	5.0
7	−24.7	23	2.0	39	NC	55	5.0
8	−24.7	24	2.0	40	NC	56	2.4
9	−24.7	25	-0.2~-6.0	41	NC	57	2.4
10	NC	26	5.0	42	0.0	58	0.0
11	NC	27	−18.5	43	4.9	59	0.0
12	0.0	28	-18 ~ -21	44	0.0	60	NC
13	5.0	29	-15 ~ -18	45	5.0	61	0.0
14	NC	30	-8.0~ -12	46	0.5	62	0.0
15	NC	31	5.0	47	5.0	63	0.0
16	−12.8	32	4.8	48	0.0	64	0.0

IC401 (TC9237F)

Pin No.	Volts	Pin No.	Volts
1	5.0	15	0.0
2	0.0	16	1.9
3	5.0	17	1.9
4	5.5	18	5.0
5	2.5	19	2.0
6	2.5	20	0.0
7	0.0	21	0.0
8	0.0	22	0.0
9	2.5	23	0.0
10	2.5	24	5.0
11	5.0	25	2.5
12	0.0	26	2.5
13	NC	27	2.5
14	0.0	28	5.0

IC101 (CXA1471S)

Pin No.	Volts
1	NC
2	2.9
3	−4.7
4	0.0
5	0.0
6	−5.0
7	0.0
8	0.0
9	NC
10	0.0
11	NC
12	NC
13	−0.9
14	−0.7
15	0.0
16	0.0
17	0.0
18	0.8
19	0.0
20	5.0
21	5.0
22	NC

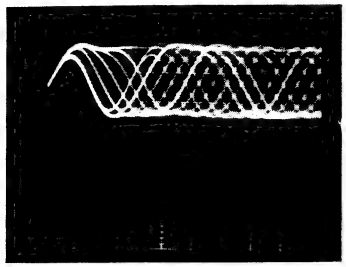
Wave Forms

Note: The encircled numbers denote measuring points in the schematic diagram.

*1 50T-JUMP: After switching to the pause mode, press the manual search key.

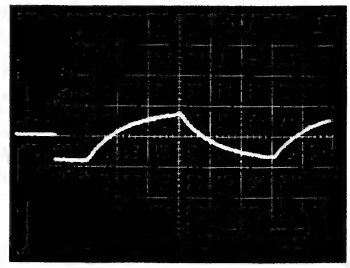
*2 FOCUS-IN: Press the key without loading a disc.

② TP1-Pin 1: PLAY MODE
(RF)
500mV/div 500nsec/div



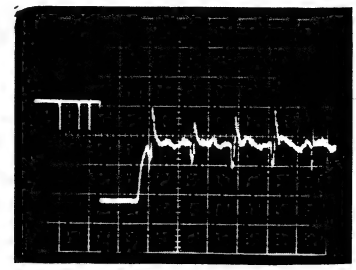
– GND

⑤ IC202-Pin 3: FOCUS-IN (*2) MODE
(FODR)
1V/div 200msec/div



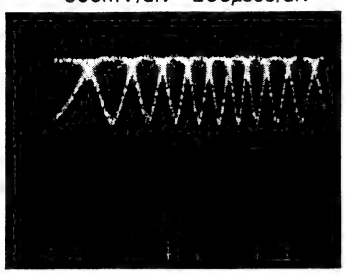
– GND

⑦ IC201-Pin 3: TRACK SEARCH MODE
(SPDR)
2V/div 50msec/div



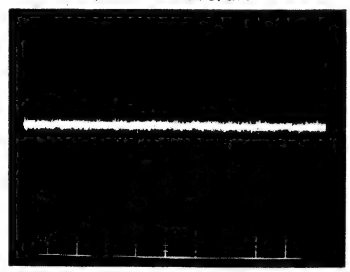
– GND

② TP1-Pin 1: TRACK SEARCH MODE
(RF)
500mV/div 200μsec/div



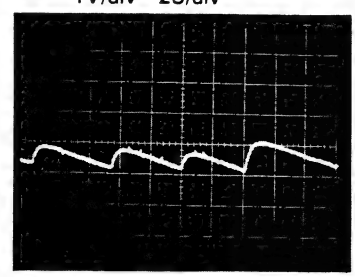
– GND

⑤ IC202-Pin 3: PLAY MODE
(FODR)
1V/div 1msec/div



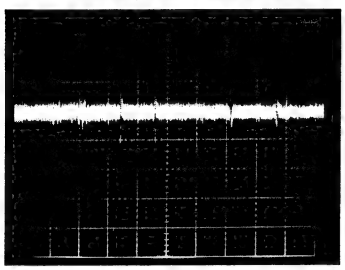
– GND

⑧ IC201-Pin 4: PLAY MODE
(CADR)
1V/div 2S/div



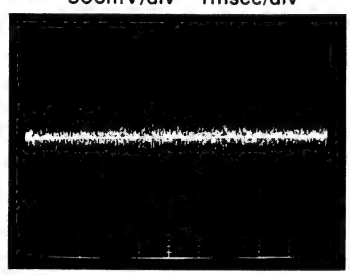
– GND

③ TP1-Pin 6: PLAY MODE
(FOER)
100mV/div 10msec/div



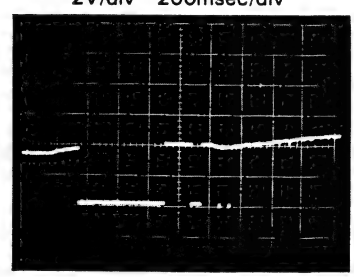
– GND

⑥ IC202-Pin 1: PLAY MODE
(TRDR)
500mV/div 1msec/div



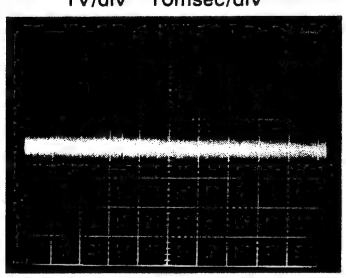
– GND

⑧ IC201-Pin 4: TRACK SEARCH MODE
(CADR)
2V/div 200msec/div



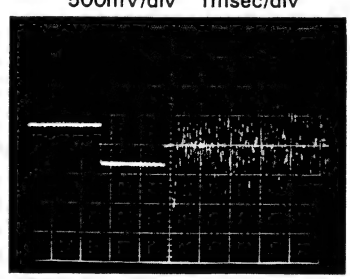
– GND

④ TP1-Pin 2: PLAY MODE
(TRER)
1V/div 10msec/div



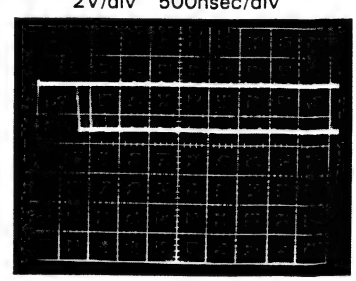
– GND

⑥ IC202-Pin 1: 50T-JUMP (*1) MODE
(TRDR)
500mV/div 1msec/div



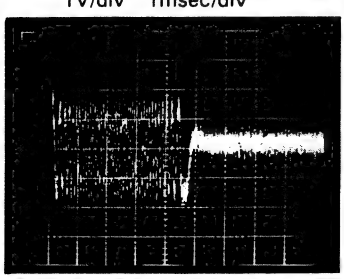
– GND

⑨ IC151-Pin 32: PLAY MODE
(EFM)
2V/div 500nsec/div



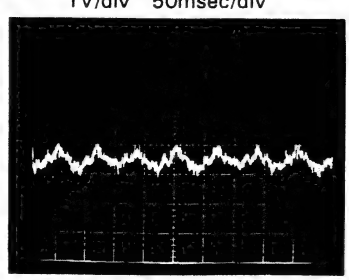
– GND

④ TP1-Pin 2: 50T-JUMP (*1) MODE
(TRER)
1V/div 1msec/div



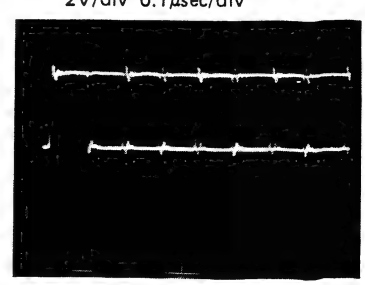
– GND

⑦ IC201-Pin 3: PLAY MODE
(SPDR)
1V/div 50msec/div

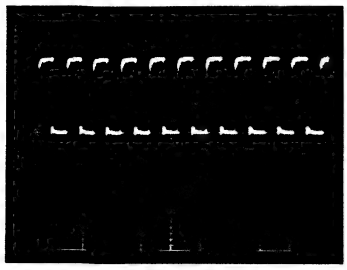


– GND

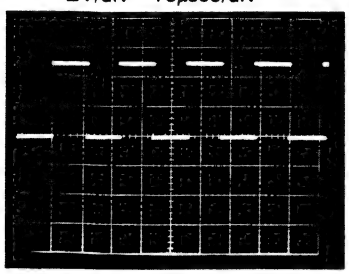
⑩ IC401-Pin 9, Pin 10:
PLAY MODE (1kHz) (D/A DETA OUT)
2V/div 0.1μsec/div



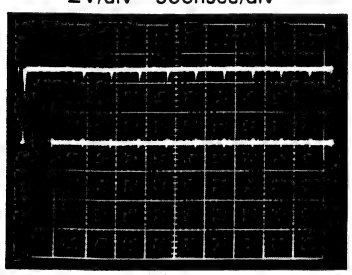
⑯ IC301-Pin 35: PLAY MODE (1kHz) (BCLK)
2V/div 500nsec/div



⑱ IC301-Pin 32: PLAY MODE (1kHz) (LRCK)
2V/div 10μsec/div

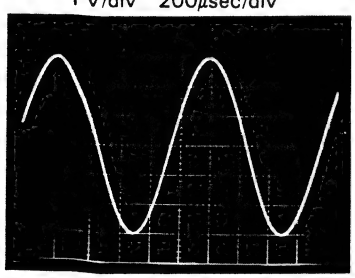


⑲ IC301-Pin 34: PLAY MODE (1kHz) (DATA)
2V/div 500nsec/div

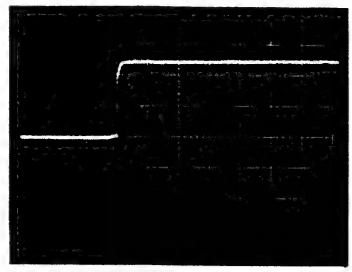


⑳

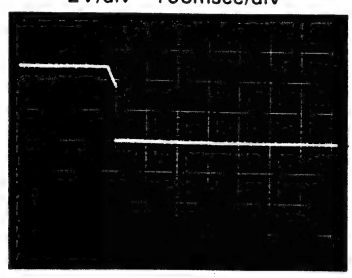
㉑ CN381-Pin 1 (Lch out) : PLAY MODE(1kHz)
1V/div 200μsec/div



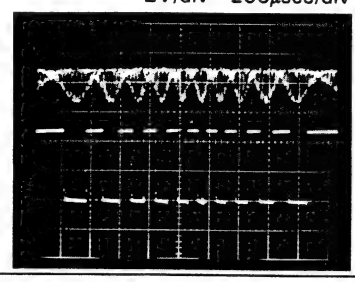
㉒ IC20-Pin 9: POWER SWITCH-ON (RST)
2V/div 100msec/div



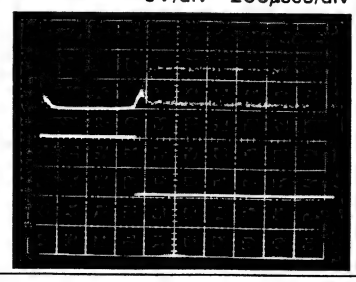
㉒ IC20-Pin 9: POWER SWITCH-OFF (RST)
2V/div 100msec/div



㉓ : TRACK SEARCH MODE
Upper: TP1-Pin 1 (RF) 1V/div
Lower: IC151-Pin 29 (MIRR)
2V/div 200μsec/div



㉔ : PLAY MODE
Upper: TP1-Pin 1 (RF) 1V/div
Lower: IC151-Pin 30 (DFCT)
5V/div 200μsec/div



㉕

㉖

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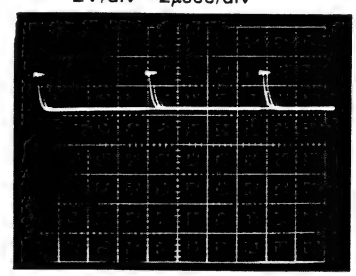
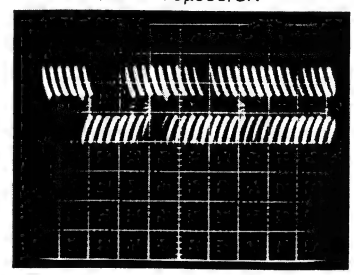
㉘

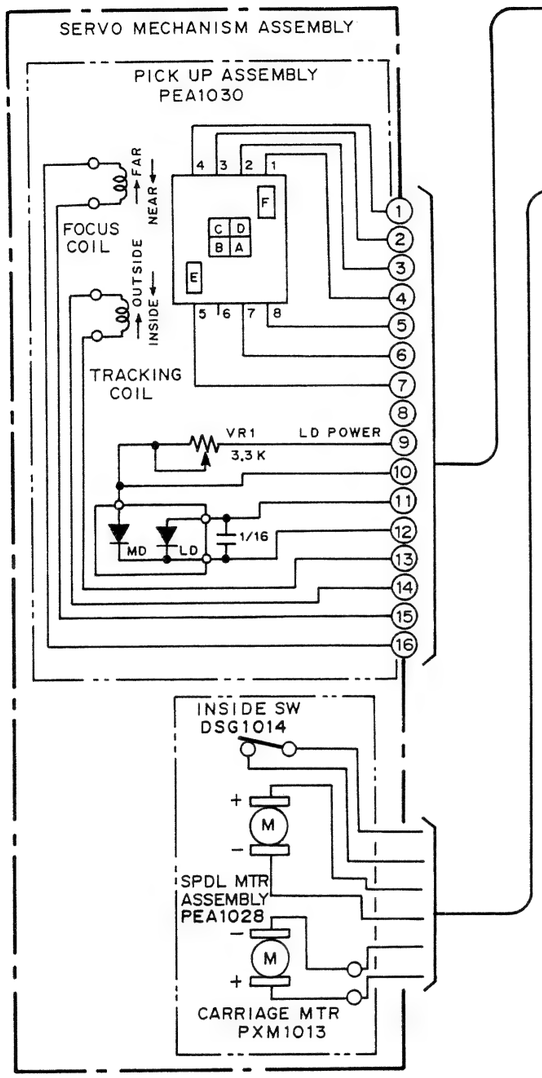
㉝ IC301-Pin 4: PLAY MODE (MDP)
2V/div 2μsec/div

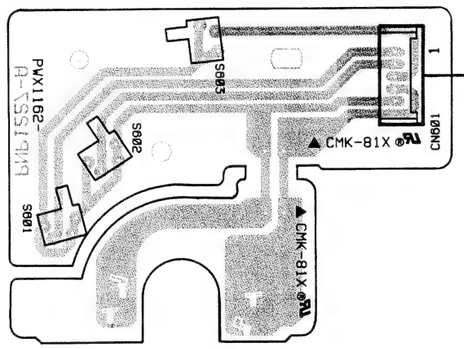


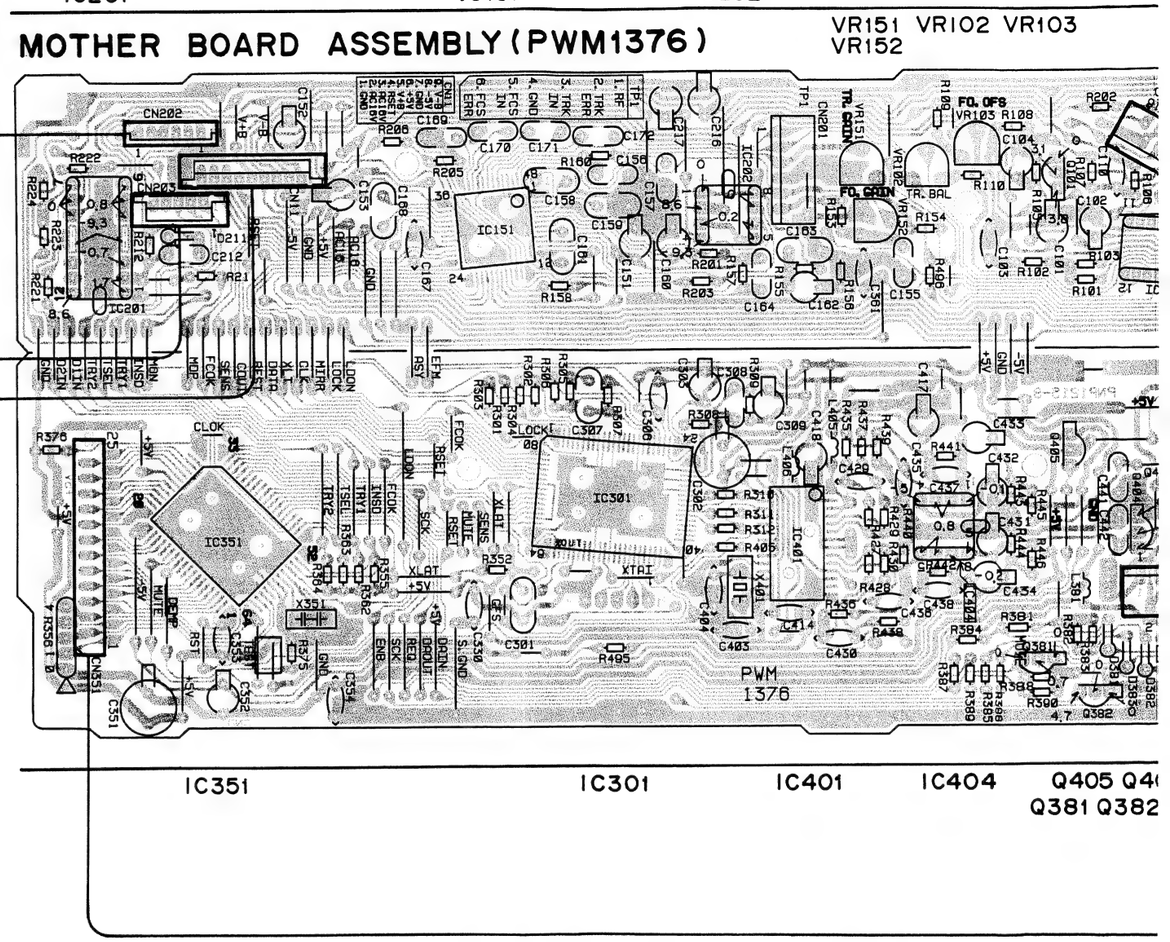
㊸ IC301-Pin 20: PLAY MODE (PCO)
2V/div 10μsec/div

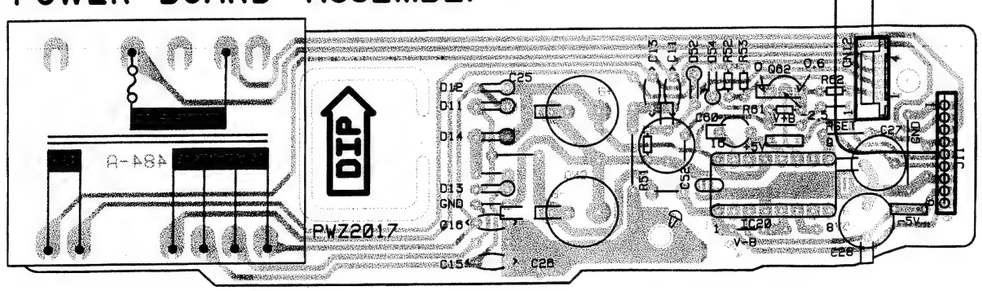


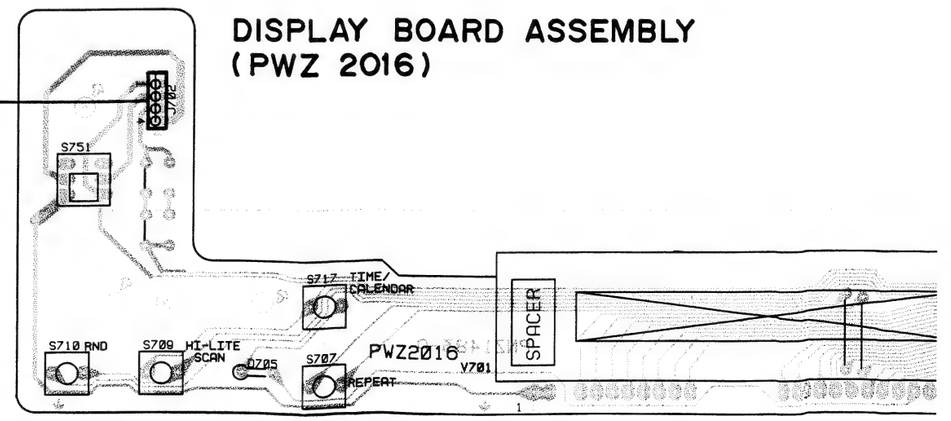
6. P.C. BOARDS CONNECTION DIAGRAM







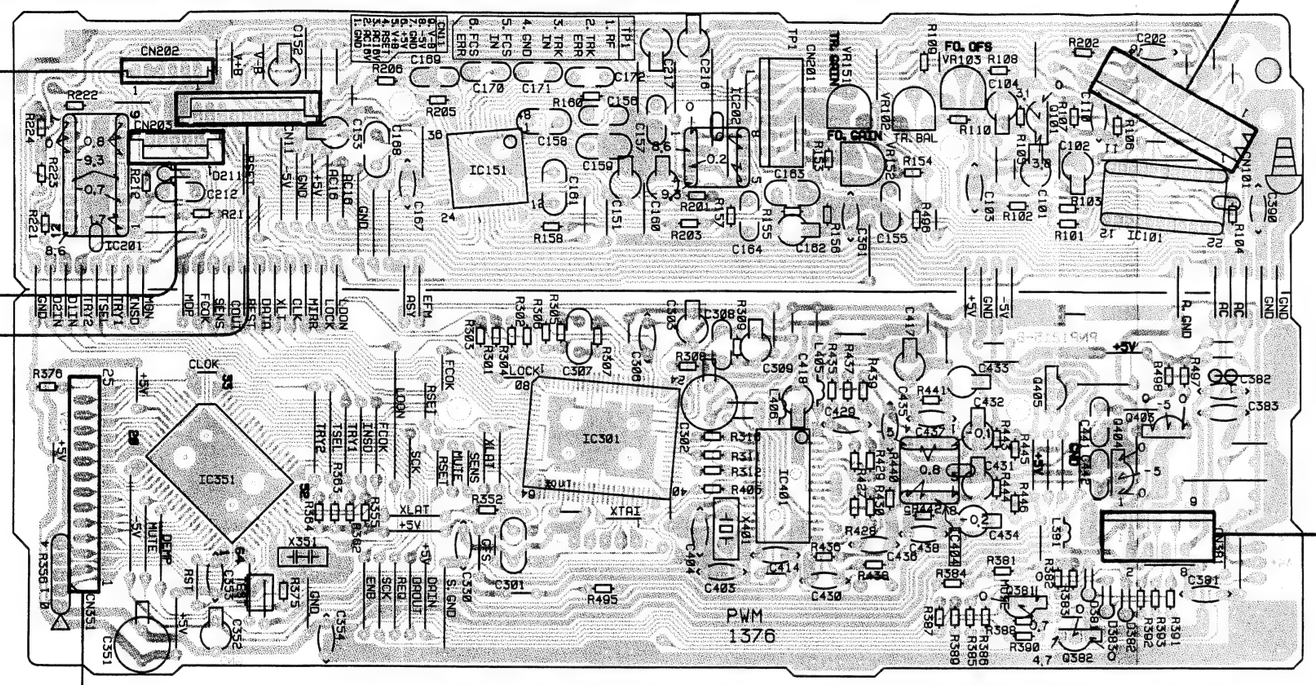




IC201 IC151 IC202 Q101 IC101

MOTHER BOARD ASSEMBLY (PWM1376)

VR151 VR102 VR103
VR152



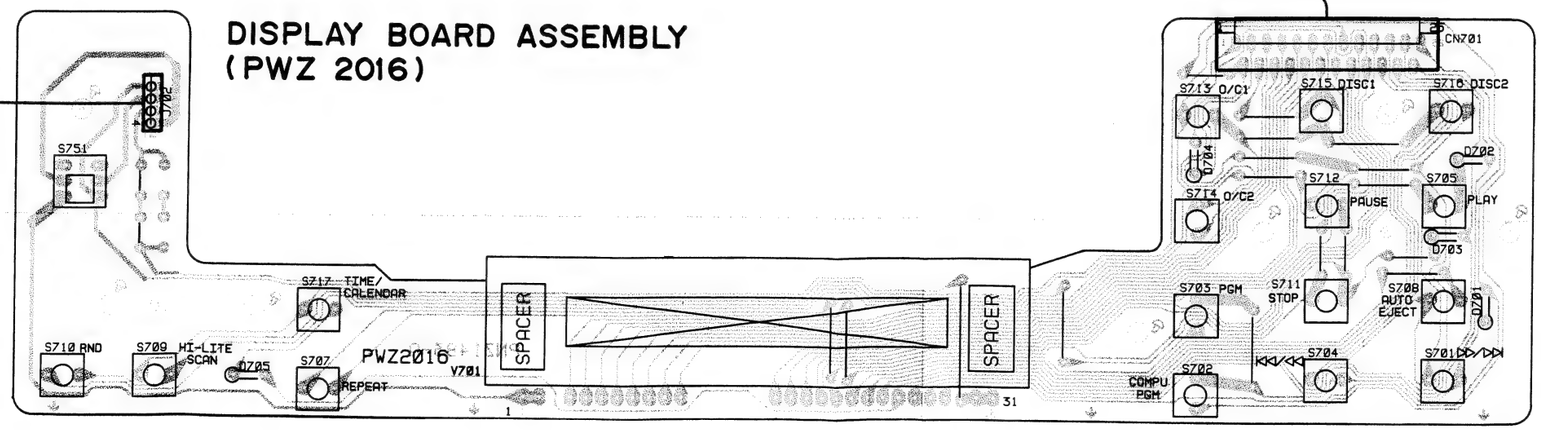
IC351 IC301 IC401 IC404 Q405 Q404 Q403
Q381 Q382

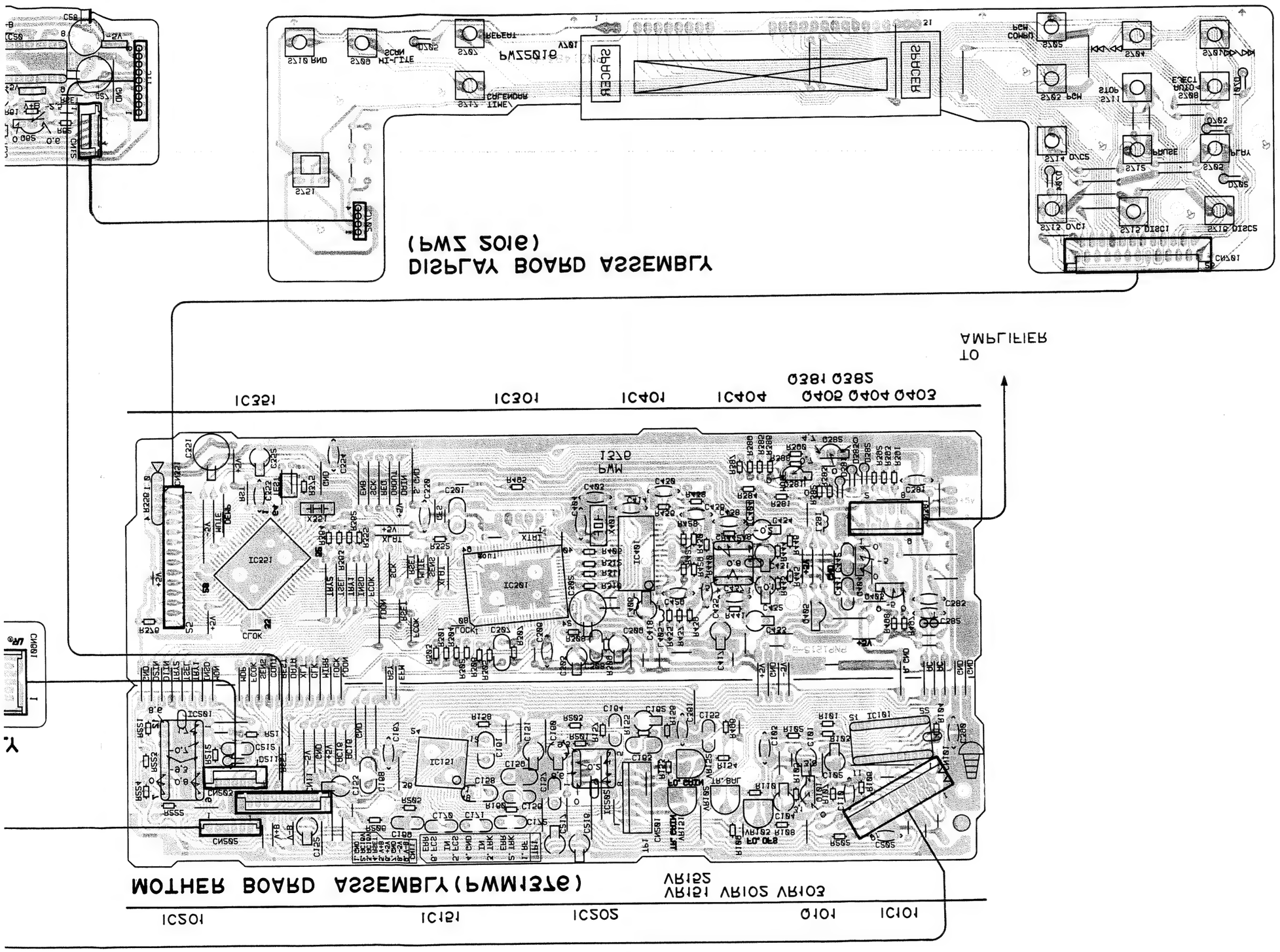
TO
AMPLIFIER

P.C.B. pattern diagram indication	Corresponding part symbol	Part name	P.C.B. pattern diagram indication	Corresponding part symbol	Part name
		Transistor			Ceramic capacitor
		FET			Mylar capacitor
		Diode	SA		Styrol capacitor
			NP		Electrolytic capacitor (Non polarized)
					Electrolytic capacitor (Noiseless)
		Zenner diode			Electrolytic capacitor (Polarized)
					Electrolytic capacitor (Polarized)
		LED			Power capacitor
		Varactor			Semi-fixed resistor
		Tact switch			Resistor array
					Resistor
		Inductor			
		Coil			Resonator
		Transformer			Thermistor
		Filter			

1. This P.C.B. connection diagram is viewed from the parts mounted side.
2. The parts which have been mounted on the board can be replaced with those shown with the corresponding wiring symbols listed in the above Table.
3. The capacitor terminal marked with ▭ shows negative terminal.
4. The diode marked with ○ shows cathode side.
5. The transistor terminal marked with ▭ shows emitter.

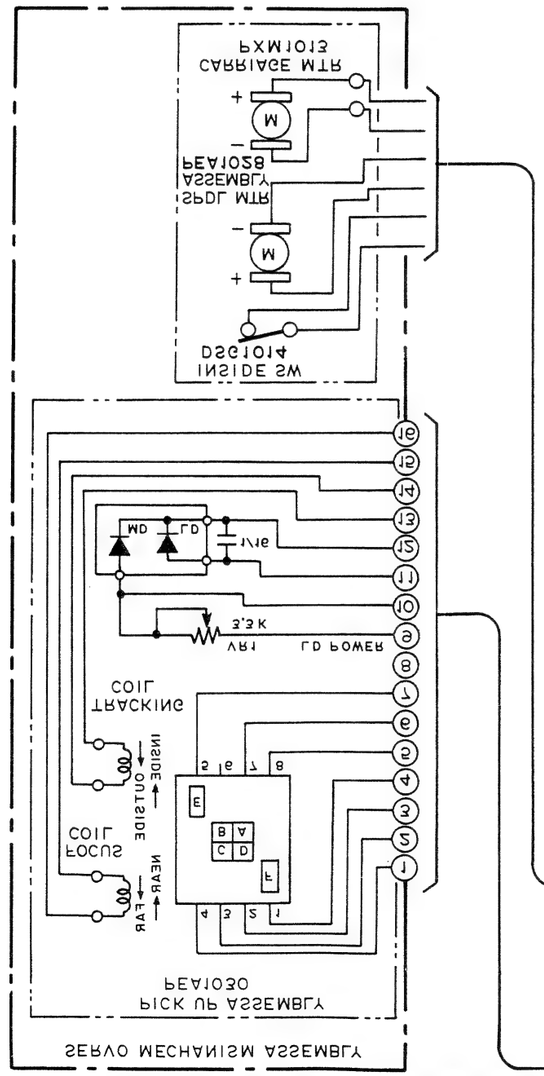
DISPLAY BOARD ASSEMBLY (PWZ 2016)

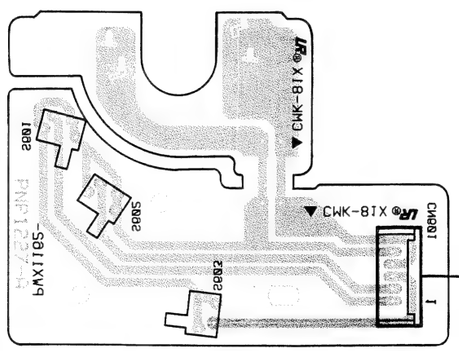


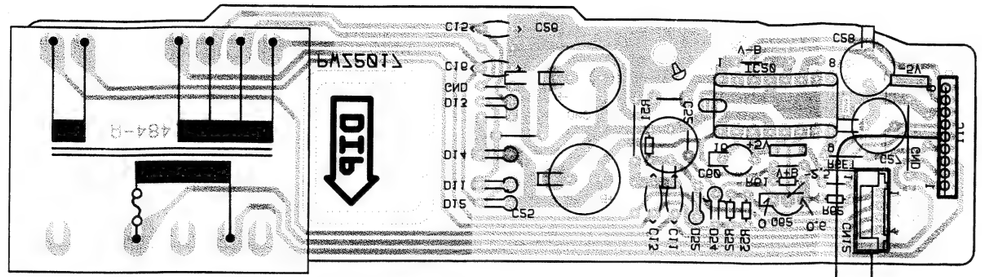

(PWZ 5016)
DISPLAY BOARD ASSEMBLY
MOTHER BOARD ASSEMBLY(PWM1376)
TO AMPLIFIER

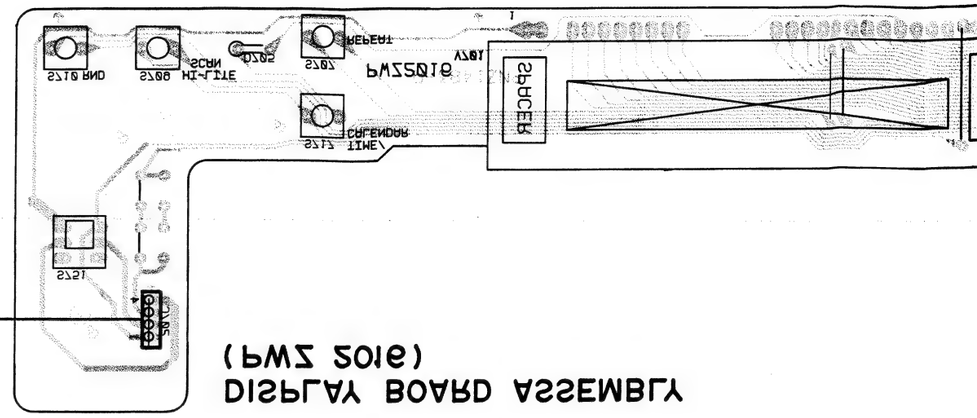
6. P.C. BOARDS CONNECTION DIAGRAM

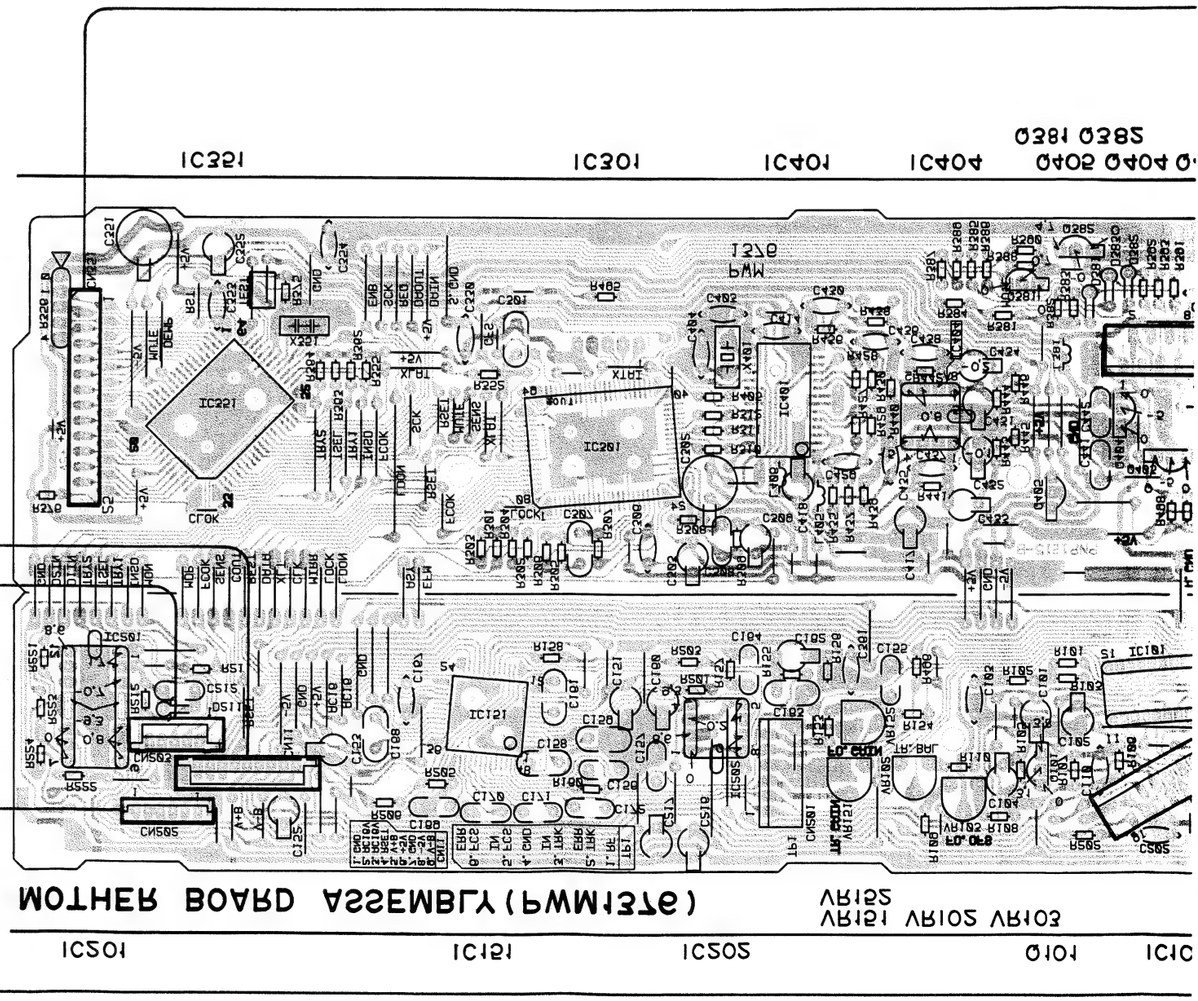
This P.C.B. connection diagram is viewed from the foil side.











7. P.C.B's PARTS LIST

NOTES:

- Parts without part number cannot be supplied.
- Parts marked by "⊙" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.
- The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex.1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%)

560 Ω → 56 × 10^1 → 561 ····· RD1/4PS 5 6 1 J
47k Ω → 47 × 10^3 → 473 ····· RD1/4PS 4 7 3 J
0.5 Ω → 0R5 ····· RN2H 0 R 5 K
1 Ω → 010 ····· RS1P 0 1 0 K

Ex.2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62k Ω → 562 × 10^1 → 5621 ····· RN1/4SR 5 6 2 1 F

Mark	No.	Symbol & Description	Part No.
		⊙ MOTHER BOARD ASSEMBLY (PWM1376)	
		SEMICONDUCTORS	
		IC101 PRE AMP IC	CXA1471S
		IC151 SERVO IC	CXA1372Q
⚠		IC201 POWER OP-AMP, IC	LA6520
⚠		IC202 POWER OP-AMP, IC	LA6517
		IC301 EFM DEMODULATION IC	CXD2500Q
		IC351 MICROCOMPUTER	PD4309B
		IC401	TC9237F
		IC404 OP-AMP IC	NJM4558D-D
		Q101 TRANSISTOR	2SA854S
		Q381, 382 TRANSISTOR	2SC1740S
		Q403, 404 TRANSISTOR	2SD2144S
		Q405 TRANSISTOR	DTC124ES
		D211 ZENNER DIODE	MTZJ6.2B
		D381-383 DIODE	1SS254
		COILS/TRANSFORMERS	
		L381 AXIAL INDUCTOR	LAU010K
		L405, 406 AXIAL INDUCTOR	LAU100K
		CAPACITORS	
		C101, 102 ELECTR. CAPACITOR	CEAS101M10
		C103 CERAMIC CAPACITOR	CCCCH180J50
		C104 ELECTR. CAPACITOR	CEAS101M10
		C110 CERAMIC CAPACITOR	CKCYF103Z50
		C151-153 ELECTR. CAPACITOR	CEAS101M10
		C155 MYLOR FILM CAPACITOR	CQMA182J50
		C156 MYLOR FILM CAPACITOR	CQMA333K50
		C157 MYLOR FILM CAPACITOR	CQMA103K50
		C158, 159 MYLOR FILM CAPACITOR	CQMA104K50
		C160 ELECTR. CAPACITOR	CEAS4R7M50
		C161 MYLOR FILM CAPACITOR	CQMA104K50
		C162 ELECTR. CAPACITOR	CEAS010M50
		C163 MYLOR FILM CAPACITOR	CQMA104K50
		C164 MYLOR FILM CAPACITOR	CQMA103K50
		C167 CERAMIC CAPACITOR	CKCYF103Z50
		C168 MYLOR FILM CAPACITOR	CQMA333K50
		C169 MYLOR FILM CAPACITOR	CQMA103K50
		C170 MYLOR FILM CAPACITOR	CQMA332J50
		C171, 172 MYLOR FILM CAPACITOR	CQMA472J50
		C202 CERAMIC CAPACITOR	CKCYF103Z50
		C212 MYLOR FILM CAPACITOR	CQMA103K50
		C216, 217 ELECTR. CAPACITOR	CEAS330M16
		C301 MYLOR FILM CAPACITOR	CQMA104K50
		C302 ELECTR. CAPACITOR	CEAS471M6R3
		C303 ELECTR. CAPACITOR	CEAS330M16
		C306 CERAMIC CAPACITOR	CKCYB152K50
		C307 MYLOR FILM CAPACITOR	CQMA473J50
		C308 MYLOR FILM CAPACITOR	CQMA103K50
		C309 ELECTR. CAPACITOR	CEASR47M50
		C330 CERAMIC CAPACITOR	CGCYX473M25
		C351 ELECTR. CAPACITOR	CEAS471M6R3
		C352 ELECTR. CAPACITOR	CEAS330M16
		C353 CERAMIC CAPACITOR	CKCYF103Z50
		C354 CERAMIC CAPACITOR	CGCYX473M25
		C361 CERAMIC CAPACITOR	CKCYF103Z50
		C381-383 CERAMIC CAPACITOR	CGCYX473M25
		C390 CERAMIC CAPACITOR	CGCYX473M25
		C403, 404 CERAMIC CAPACITOR	CCCCH470J50
		C414-418 MYLOR FILM CAPACITOR	CQMA103K50
		C429, 430 CERAMIC CAPACITOR	CCCCH560J50
		C431, 432 ELECTR. CAPACITOR	CEAS330M16
		C433, 434 ELECTR. CAPACITOR	CEAS220M25
		C435-438 CERAMIC CAPACITOR	CCCCH390J50
		C441, 442 MYLOR FILM CAPACITOR	CQMA152J50
		RESISTORS	
		R101-110 CARBONFILM RESISTOR	RD1/6PM□□□J
		R153-158 CARBONFILM RESISTOR	RD1/6PM□□□J
		R160 CARBONFILM RESISTOR	RD1/6PM□□□J
		R201-203 CARBONFILM RESISTOR	RD1/6PM□□□J
		R205, 206 CARBONFILM RESISTOR	RD1/6PM□□□J
		R211, 212 CARBONFILM RESISTOR	RD1/6PM□□□J
		R221-224 CARBONFILM RESISTOR	RD1/6PM□□□J
		R301-312 CARBONFILM RESISTOR	RD1/6PM□□□J
		R352 CARBONFILM RESISTOR	RD1/6PM□□□J

Mark	No.	Symbol & Description	Part No.
		R355 CARBONFILM RESISTOR	RD1/6PM□□□J
		R356 RESISTOR ARRAY (10K)	RA4S□□□J
		R362-364 CARBONFILM RESISTOR	RD1/6PM□□□J
		R375, 376 CARBONFILM RESISTOR	RD1/6PM□□□J
		R381-393 CARBONFILM RESISTOR	RD1/6PM□□□J
		R405 CARBONFILM RESISTOR	RD1/6PM□□□J
		R427-430 CARBONFILM RESISTOR	RD1/6PM□□□J
		R435-446 CARBONFILM RESISTOR	RD1/6PM□□□J
		R495-498 CARBONFILM RESISTOR	RD1/6PM□□□J
		VR102 VR	VRTB6VS223
		VR103 VR	VRTB6VS102
		VR151, 152 VR	VRTB6VS223
		OTHERS	
		CN101	5597-16CPB
		CN351 CONNECTOR	HLEM25S-1
		CN381 CONNECTOR(9P)	KPE9
		X351 CERAMIC RESONATOR	VSS1014
		X401 XTAL RES (OSC)	PSS1008

⊙ DISPLAY BOARD ASSEMBLY (PWZ2016)

		SEMICONDUCTORS	
		D701-705 DIODE	1SS254
		SWITCHES	
		S701-705 SWITCH	PSG1006
		S707-717 SWITCH	PSG1006
		S751 SWITCH	PSG1007
		OTHERS	
		CN701 CONNECTOR	HLEM25R-1
		V701 FL INDICATOR TUBE	PEL1050

POWER BOARD ASSEMBLY

		SEMICONDUCTORS	
⚠		IC20 REGULATOR IC	M5298P
		Q62 TRANSISTOR	2SC1740S
⚠		D11-14 DIODE	11ES2
⚠		D52 DIODE	11ES2
		D54 ZENNER DIODE	MTZJ18B
		CAPACITORS	
		C11 CERAMIC CAPACITOR	CKCYF103Z50
		C13 CERAMIC CAPACITOR	CKCYF103Z50
		C15, 16 CERAMIC CAPACITOR	CKCYF103Z50
		C25 ELECTR. CAPACITOR	CEAS332M16
		C26 ELECTR. CAPACITOR	CEAS102M16
		C27 ELECTR. CAPACITOR	CEAS471M6R3
		C28 ELECTR. CAPACITOR	CEAS101M10
		C52 ELECTR. CAPACITOR	CEAS101M35
		C60 ELECTR. CAPACITOR	CEAS010M50
		RESISTORS	
		R51-53 CARBONFILM RESISTOR	RD1/6PM□□□J
		R61, 62 CARBONFILM RESISTOR	RD1/6PM□□□J

Mark	No.	Symbol & Description	Part No.

MECHANISM PCB ASSEMBLY

		SWITCHES	
		S601-603 PUSH SWITCH	DSG1017

8. ADJUSTMENTS

1. Adjustment Methods

If a disc player is adjusted incorrectly or inadequately, it may malfunction or not work at all even though there is nothing at all wrong with the pickup or the circuitry. Adjust correctly following the adjustment procedure.

1-1 Adjustment items/verification items and order

Step	Item	Test point	Adjustment location
1	Focus offset adjustment	TP1, Pin 6 (FCS. ERR)	VR103 (FCS. OFS)
2	Grating adjustment	TP1, Pin 2 (TRK. ERR)	Grating adjustment slit
3	Tracking error balance adjustment	TP1, Pin 2 (TRK. ERR)	VR102 (TRK. BAL)
4	Pickup radial/ tangential direction tilt adjustment	TP1, Pin 1 (RF)	Radial tilt adjustment screw Tangential tilt adjustment screw
5	RF level adjustment	TP1, Pin 1 (RF)	VR1 (RF level)
6	Focus servo loop gain adjustment	TP1, Pin 5 (FCS. IN) TP1, Pin 6 (FCS. ERR)	VR152 (FCS. GAN)
7	Tracking servo loop gain adjustment	TP1, Pin 3 (TRK. IN) TP1, Pin 2 (TRK. ERR)	VR151 (TRK. GAN)
8	Focus error signal verification	TP1, Pin 6 (FCS. ERR)	———

● **Abbreviation table**

FCS. ERR : Focus Error
FCS. OFS : Focus Offset
TRK. ERR : Tracking Error
TRK. BAL : Tracking Balance
FCS. IN : Focus In
TRK. IN : Tracking In

1-2 Measuring instruments and tools

1. Dual trace oscilloscope (10:1 probe)
2. Low-frequency oscillator
3. Test disc (YEDS-7)
4. 12-cm disc (with at least about 70 minutes of recording)
5. Low-pass filter (39 kΩ + 0.001 μF)
6. Resistor (100 kΩ)
7. Hexagonal wrench (M3 mm)
8. Standard tools

1-3 Test point and adjustment variable resistor positions

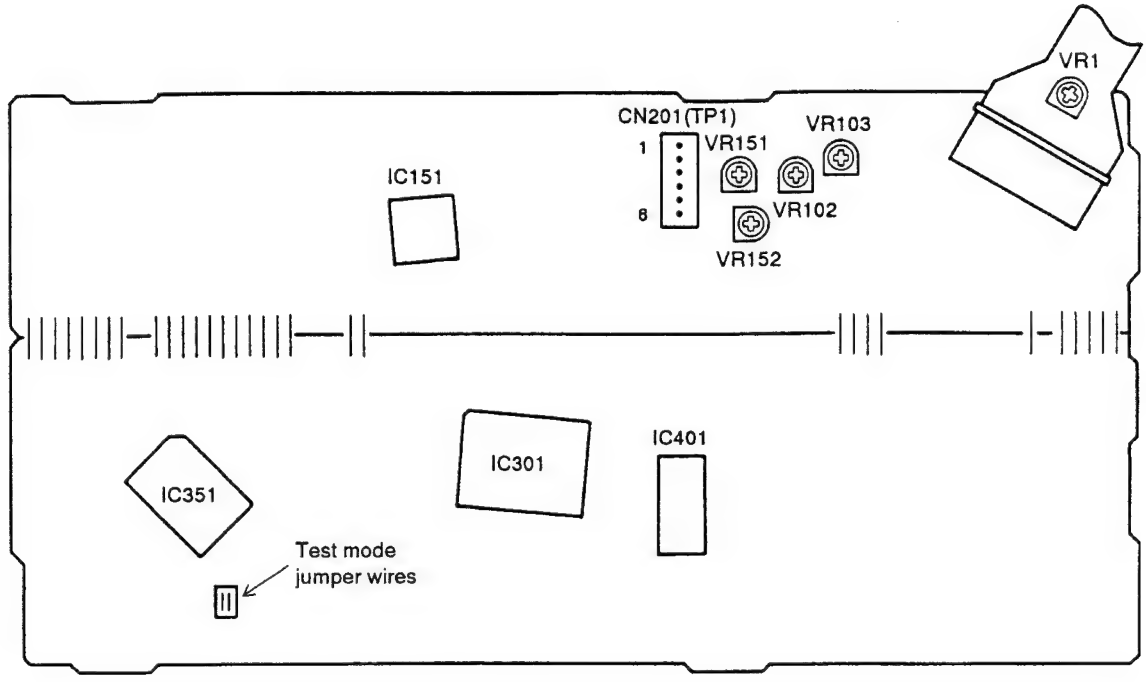


Figure 1 Adjustment Locations

1-4 Notes

1. Use a 10:1 probe for the oscilloscope.
2. All the knob positions (settings) for the oscilloscope in the adjustment procedures are for when a 10:1 probe is used.

1-5 Test mode

These models have a test mode so that the adjustments and checks required for service can be carried out easily. When these models are in test mode, the keys on the front panel work differently from normal. Adjustments and checks can be carried out by operating these keys with the correct procedure. For these models, all adjustments are carried out in test mode.

[Setting these models to test mode]

How to set this model into test mode.
1. Turn off the power switch.
2. Short the test mode jumper wires. (See Figure 1.)
3. Turn on the power switch.

When the test mode is set correctly, the display is different from what it usually is when the power is turned on. If the display is still the same as usual, test mode has not been set correctly, so repeat Steps 1-3.

[Release from test mode]

Here is the procedure for releasing the test mode:

1. Press the STOP key and stop all operations.
2. Turn off the power switch on the front panel.

[Operations of the keys in test mode]

Code	Key name	Function in test mode	Explanation
	PROGRAM	Focus servo close	If Disc Tray 1 is closed, Disk Tray 1 is moved to the play position. Then the laser diode is lit up and the focus actuator is lowered, then raised slowly and the focus servo is closed at the point where the objective lens is focused on the disc. With the player in this state, if you lightly rotate the stopped disc by hand, you can hear the sound the focus servo. If you can hear this sound, the focus servo is operating correctly. If you press this key with no disc mounted, the laser diode lights up, the focus actuator is pulled down, then the actuator is raised and lowered twice and returned to its original position.
►	PLAY	Spindle servo ON	Starts the spindle motor in the clockwise direction and when the disc rotation reaches the prescribed speed (about 500 rpm at the inner periphery), sets the spindle servo in a closed loop. Be careful. Pressing this key when there is no disc mounted makes the spindle motor run at the maximum speed. If the focus servo does not go correctly into a closed loop or the laser light shines on the mirror section at the outermost periphery of the disc, the same symptom is occurred.
▮▮	PAUSE	Tracking servo close/open	Pressing this key when the focus servo and spindle servo are operating correctly in closed loops puts the tracking servo into a closed loop, displays the track number being played back and the elapsed time on the front panel, and outputs the playback signal. If the elapsed time is not displayed or not counted correctly or the audio is not played back correctly, it may be that the laser is shining on the section with no sound recorded at the outer edge of the disc, that something is out of adjustment, or that there is some other problem. This key is a toggle key and open/close the tracking servo alternately. This key has no effect if no disc is mounted.
◄◄/ ⏮	TRACK/ MANUAL SEARCH REV	Carriage reverse (inwards)	Moves the pickup position toward the inner periphery of the disc. When this key is pressed with the tracking servo in a closed loop, the tracking servo automatically goes into an open loop. Since the pickup does not automatically stop at the mechanical end point in test mode, be careful with this operation.
⏭/ ►►	TRACK/ MANUAL SEARCH FWD	Carriage forward (outwards)	Moves the pickup position toward the outer periphery of the disc. When this key is pressed with the tracking servo in a closed loop, the tracking servo automatically goes into an open loop. Since the pickup does not automatically stop at the mechanical end point in test mode, be careful with this operation.
■	STOP	Stop	Switches off all the servos and initializes. The pickup remains where it was when this key was pressed.
	OPEN/CLOSE DISC 1	Disc tray open/close	Opens/closes the disc tray. This key is a toggle key and open/close tray alternately.

[How to play back a disc in test mode]

In test mode, since the servos operate independently, playing back a disc requires that you operate the keys in the correct order to close the servos.
Here is the key operation sequence for playing back a disc in test mode.

PROGRAM	Lights up the laser diode and closes the focus servo.
⇩	
PLAY ►	Starts the spindle motor and closes the spindle servo.
⇩	
PAUSE ▮▮	Closes the tracking servo.

Wait at least 2-3 seconds between each of these operations.

1. Focus offset adjustment

● Objective ● Symptom when out of adjustment	Sets the DC offset for the focus error amp. The player does not focus in and the RF signal is dirty.		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 6 (FCS ERR). [Settings] 5 mV/division 10 ms/division DC mode	● Player state ● Adjustment location ● Disc	Test mode, stopped (just the Power switch on) VR103 (FCS OFS) None needed

[Procedure]

Adjust VR103 (FCS OFS) so that the DC voltage at TP1, Pin 6 (FCS ERR) is –50 ± 50 mV.

2. Grating adjustment

● Objective ● Symptom when out of adjustment	To align the tracking error generation laser beam spots to the optimum angle on the track Play does not start, track search is impossible, tracks are skipped.		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 2 (TRK ERR) via a low pass filter. (See Figure 2) [Settings] 50 mV/division 5 ms/division DC mode	● Player state ● Adjustment location ● Disc	Test mode, focus and spindle servos closed and tracking servo open Pickup grating adjustment slit 12 cm disc. (YEDS-7 can not be used.)

[Procedure]

1. Move the pickup to the outer edge of the disc with the TRACK/MANUAL SEARCH FWD ▶▶|/▶▶ or |◀◀/◀◀ key so that the grating adjustment slit is at the outer edge of the disc where it can be adjusted.
2. Press the PROGRAM key, then the PLAY ▶ key in that order to close the focus servo then the spindle servo.
3. Insert an ordinary screwdriver into the grating adjustment slit and adjust the grating to find the null point. For more details, see the next page.
4. If you slowly turn the screwdriver counterclockwise from the null point, the amplitude of the wave gradually increases, then if you continue turning the screwdriver, the amplitude of the wave becomes smaller again. Turn the screwdriver counterclockwise from the null point and set the grating to the first point where the wave amplitude reaches its maximum.

   Reference: Figure 3 shows the relation between the angle of the tracking beam with the track and the wave form.

   Note: The amplitude of the tracking error signal is about 3 Vp-p (when a 39 kΩ + 0.001 µF low pass filter is used). If this amplitude is extremely small (2 Vp-p or less), the objective lens may be dirty or the pickup malfunctioning. If the difference between the amplitude of the error signal at the innermost edge and outermost edge of the disc is more than 10%, the grating is not adjusted to the optimum point, so adjust it again.
5. Return the pickup to more or less midway across the disc with the TRACK/MANUAL SEARCH REV ◀◀|/|◀◀ key, press the PAUSE ▮▮ key and check that the track number and elapsed time are displayed on the front panel. If they are not displayed at this time or the elapsed time changes irregularly, check the null point and adjust the grating again.

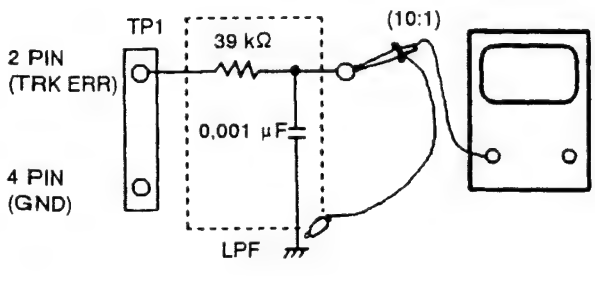
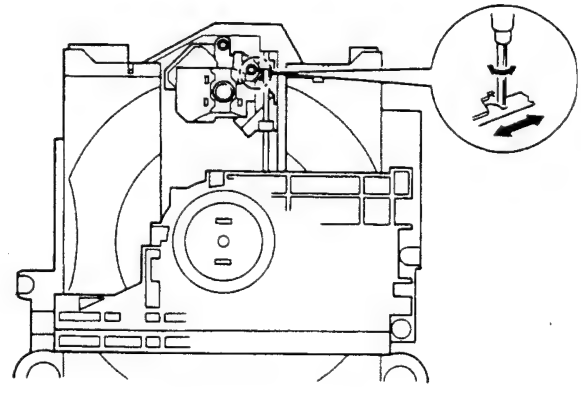


Figure 2



Adjustment Locations

[How to find the null point]

When you insert the regular screwdriver into the slit for the grating adjustment and change the grating angle, the amplitude of the tracking error signal at TP1 Pin 2 changes. Within the range for the grating, there are five or six locations where the amplitude of the wave reaches a minimum. Of these five or six locations, there is only one at which the envelope of the wave form is smooth. This location is where the three laser beams divided by the grating are all right above the same track. (See Figure 3.)
This point is called the null point. When adjusting the grating, this null point is found and used as the reference position.

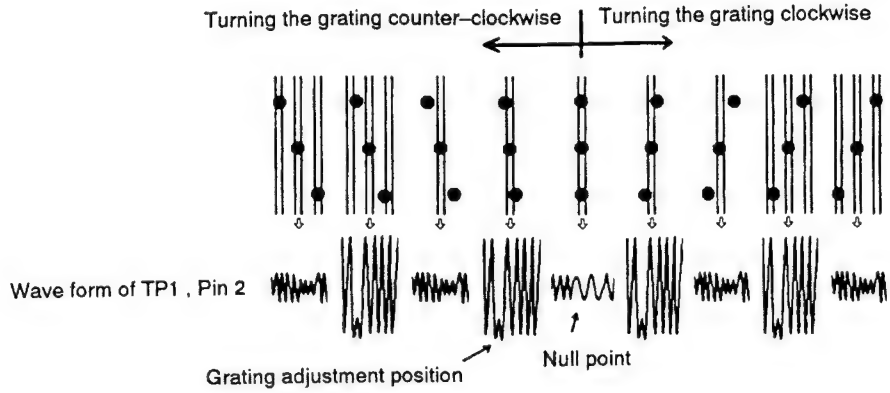
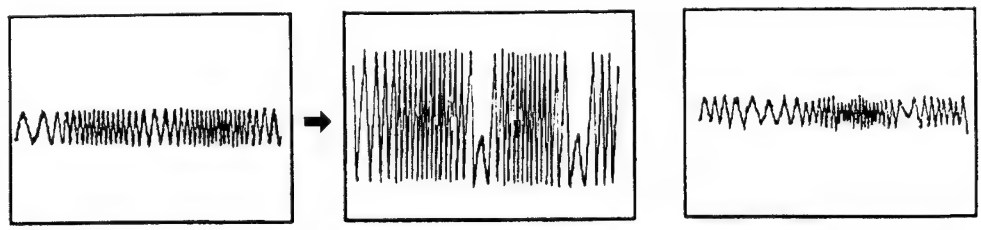


Figure 3



Nullo point waveform

Maximum amplitude waveform

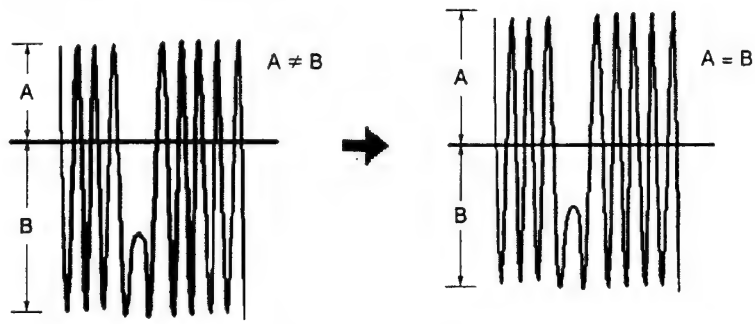
Waveform other than the null point

3. Tracking error balance adjustment

● Objective	To correct for the variation in the sensitivity of the tracking photodiode		
● Symptom when out of adjustment	Play does not start or track search is impossible		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 2 (TRK ERR). This connection may be via a low pass filter. [Settings] 50 mV/division 5 ms/division DC mode	● Player state ● Adjustment location ● Disc	Test mode, focus and spindle servos closed and tracking servo open VR102 (TRK BAL) YEDS-7

[Procedure]

1. Move the pickup to midway across the disc (R = 35 mm) with the TRACK/MANUAL SEARCH FWD ▶▶| / ▶▶ or |◀◀ / ◀◀ key.
2. Press the PROGRAM key, then the PLAY ▶ key in that order to close the focus servo then the spindle servo.
3. Line up the bright line (ground) at the center of the oscilloscope screen and put the oscilloscope into DC mode.
4. Adjust VR102 (TRK BAL) so that positive amplitude and negative amplitude of the tracking error signal at TP1 Pin 2 (TRK ERR) are the same (in other words, so that there is no DC component).



When there is a DC component

When there is no DC component

4. Pickup radial/tangential tilt adjustment

● Objective	To adjust the angle of the pickup relative to the disc so that the laser beams are shone straight down into the disc for the best read out of the RF signals.		
● Symptom when out of adjustment	Sound broken; some discs can be played but not others.		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 1 (RF). [Settings] 20 mV/division 200 ns/division AC mode	● Player state ● Adjustment location ● Disc	Test mode, play Pickup radial tilt adjustment screw and tangential tilt adjustment screw 12 cm disc. (YEDS-7 can not be used.)

[Procedure]

1. Move the pickup to the outer edge of the disc with the TRACK/MANUAL SEARCH FWD ▶▶| / ▶▶ or |◀◀ / ◀◀ key so that the radial/tangential tilt screws can be adjusted.
   Press the PROGRAM key, the PLAY ▶ key, then the PAUSE ❚❚ key in that order to close the focus servo then the spindle servo and put the player into play mode.
2. First, adjust the radial tilt adjustment screw with an M3 mm hexagonal wrench so that the eye pattern (the diamond shape at the center of the RF signal) can be seen the most clearly.
3. Next, adjust the tangential tilt adjustment screw with an M3 mm hexagonal wrench so that the eye pattern (the diamond shape at the center of the RF signal) can be seen the most clearly (Figure 5).
4. Adjust the radial tilt adjustment screw and the tangential tilt adjustment screw again so that the eye pattern can be seen the most clearly. As necessary, adjust the two screws alternately so that the eye pattern can be seen the most clearly.

   Note: Radial and tangential mean the directions relative to the disc shown in Figure 4.

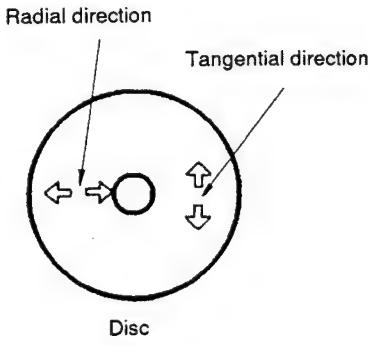
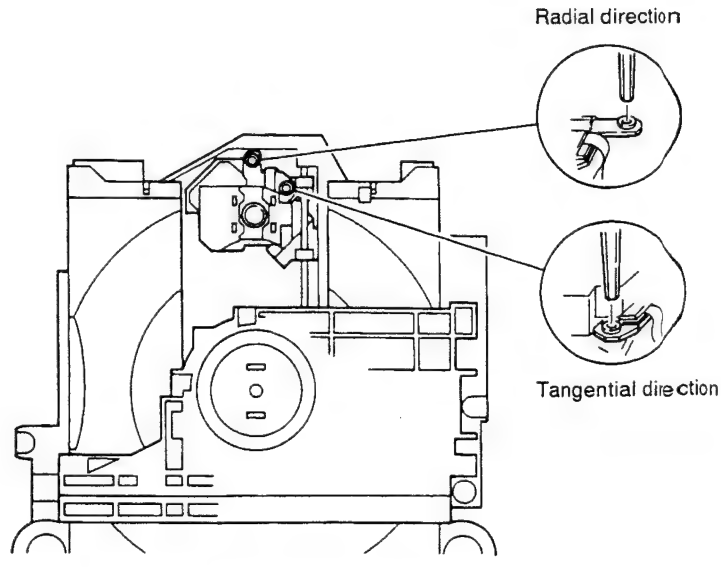


Figure 4



Adjustment Locations

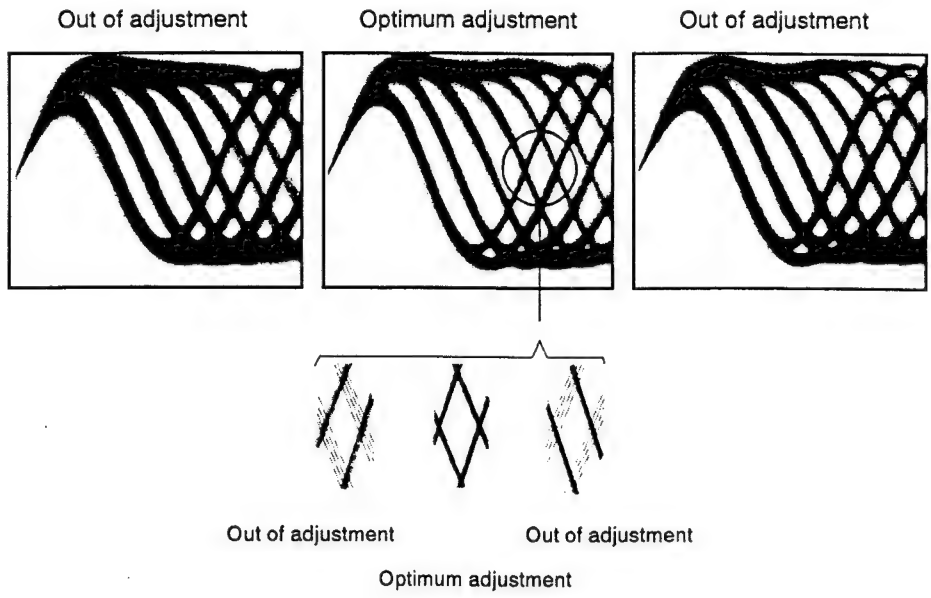


Figure 5 Eye Pattern

5. RF level adjustment

● Objective ● Symptom when out of adjustment	To optimize the playback RF signal amplitude No play or no search		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 1 (RF). [Settings] 50 mV/division 10 ms/division AC mode	● Player state ● Adjustment location ● Disc	Test mode, play VR1 (laser power) YEDS-7

[Procedure]

1. Move the pickup to midway across the disc (R = 35 mm) with the TRACK/MANUAL SEARCH FWD ▶▶| / ▶▶ or |◀◀ / ◀◀ key, then press the PROGRAM key, then the PLAY ▶ key in that order to close the respective servos and put the player into play mode.
2. Adjust VR1 (laser power) so that the RF signal amplitude is 1.2 Vp-p ± 0.1V.

6. Focus servo loop gain adjustment

● Objective ● Symptom when out of adjustment	To optimize the focus servo loop gain Playback does not start or focus actuator noisy		
● Measurement instrument connections	See Figure 6. [Settings] CH1 CH2 20 mV/division 5 mV/division X-Y mode	● Player state ● Adjustment location ● Disc	Test mode, play VR152 (FCS GAN) YEDS-7

[Procedure]

1. Set the AF generator output to 1.2 kHz and 1 Vp-p.
2. Press the TRACK/MANUAL SEARCH FWD ▶▶| / ▶▶ or ◀◀ / |◀◀ key to move the pickup to halfway across the disc (R = 35 mm), then press the PROGRAM key, the PLAY ▶ key, then the PAUSE ▮▮ key in that order to close the corresponding servos and put the player into play mode.
3. Adjust VR152 (FCS GAN) so that the Lissajous wave form is symmetrical about the X axis and the Y axis.

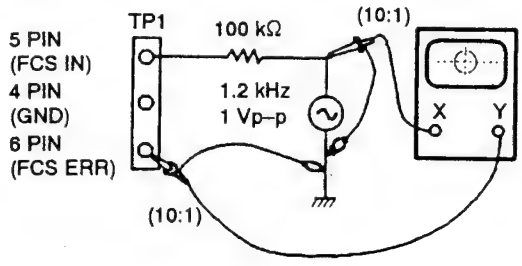
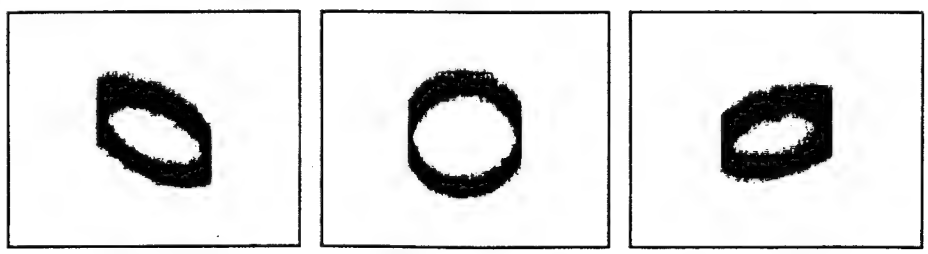


Figure 6

Focus Gain Adjustment



Higher gain | Optimum gain | Lower gain

7. Tracking servo loop gain adjustment

● Objective ● Symptom when out of adjustment	To optimize the tracking servo loop gain Playback does not start, during searches the actuator is noisy, or tracks are skipped.		
● Measurement instrument connections	See Figure 7. [Settings] CH1 CH2 50 mV/division 50 mV/division X-Y mode	● Player state ● Adjustment location ● Disc	Test mode, play VR151 (TRK GAN) YEDS-7

[Procedure]

1. Set the AF generator output to 1.2 kHz and 2 Vp-p.
2. Press the TRACK/MANUAL SEARCH FWD ▶▶| / ▶▶ or |◀◀ / ◀◀ key to move the pickup to halfway across the disc (R = 35 mm), then press the PROGRAM key, the PLAY ▶ key, then the PAUSE ▮▮ key in that order to close the corresponding servos and put the player into play mode.
3. Adjust VR151 (TRK GAN) so that the Lissajous wave form is symmetrical about the X axis and the Y axis.

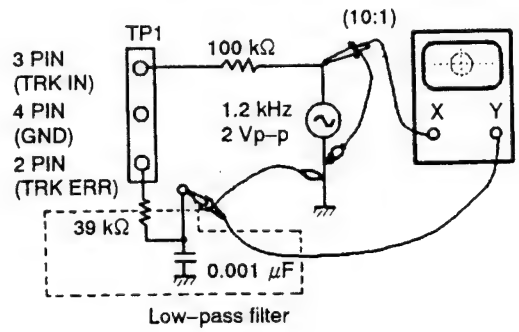
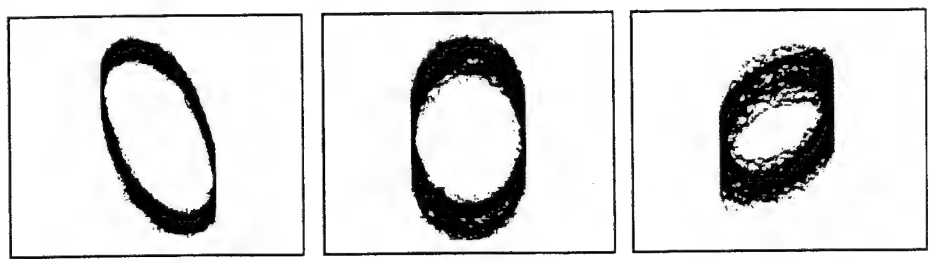


Figure 7

Tracking Gain Adjustment



Higher gain Optimum gain Lower gain

8. Focus error signal (focus S curve) verification

● Objective ● Symptom when out of adjustment	To judge whether the pickup is ok or not by observing the focus error signal. The pickup is judged from the amplitude of the tracking error signal (as discussed in the section on adjusting the tracking error balance) and the wave form for the focus error signal.		
● Measurement instrument connections	Connect the oscilloscope to TP1, Pin 6 (FCS ERR). [Settings] 100 mV/division 5 ms/division DC mode	● Player state ● Adjustment location ● Disc	Test mode, stop None YEDS-7

[Procedure]

1. Connect TP1 Pin 5 to ground.
2. Mount the disc.
3. While watching the oscilloscope screen, press the PROGRAM key and observe the wave form in Figure 8 for a moment. Verify that the amplitude is at least 2.5 Vp-p and that the positive and negative amplitude are about equal. Since the wave form is only output for a moment when the PROGRAM key is pressed, press this key over and over until you have checked the wave form.

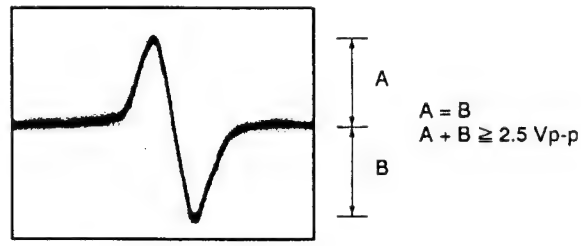


Figure 8

[Judging the pickup]

Do not judge the pickup until all the adjustments have been made correctly. In the following cases, there may be something wrong with the pickup.

1. The tracking error signal amplitude is extremely small (less than 2 Vp-p).
2. The focus error signal amplitude is extremely small (less than 2.5 Vp-p).
3. The positive and negative amplitudes of the focus error signal are extremely asymmetrical (2:1 ratio or more).
4. The RF signal is too small (less than 0.8 Vp-p) and even if VR1 is adjusted (laser power), the RF signal can not be brought up to the standard level.

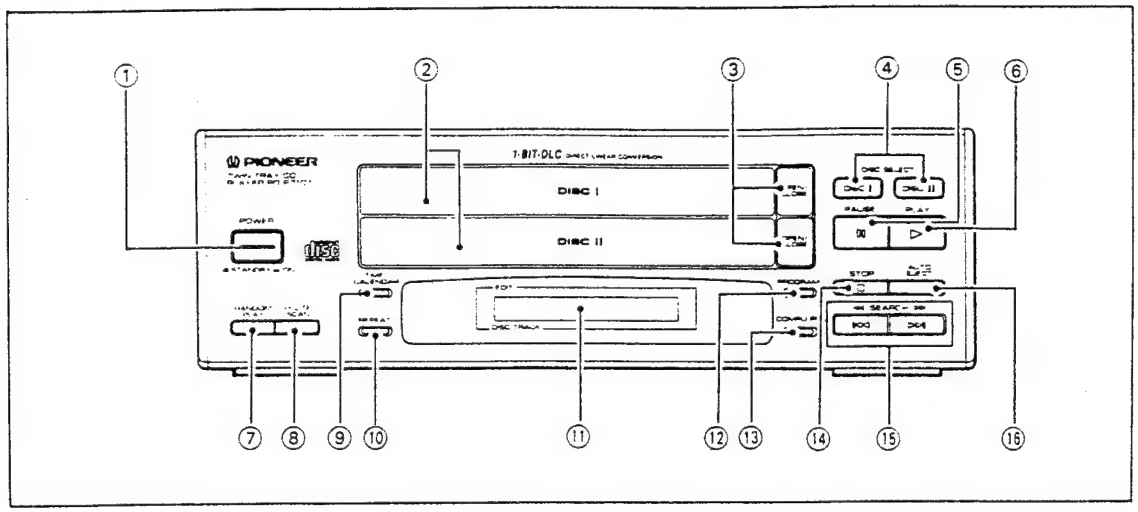
9. IC INFORMATION (TC9237F)

● TC9237F (DIGITAL FILTER & D/A CONVERTER)

Pin Function

Pin No.	Pin Name	I/O	Function	Remarks
1	M/L	I	MSB First/LSB First select terminal for input data "H" : MSB First, "L" : LSB First	Pull-up
2	MUTE	I	Muting terminal "H" : mutes output signal	
3	AT	I	Normally "H"	
4	VDA	–	Power input for DA converter (R channel)	
5	RO	O	R channel data output terminal	
6	$\overline{RO}$	O	R channel data output terminal	
7	GNDA	–	Ground terminal for DA converter (R channel)	
8	GNDA	–	Ground terminal for DA converter (L channel)	
9	$\overline{LO}$	O	L channel data output terminal	
10	LO	O	L channel data output terminal	
11	VDA	–	Power input for DA converter (L channel)	
12	C	I	Fix to "L".	
13	TEST	I	Test terminal Normally "H" or open	Pull-up
14	GND	–	Ground terminal for logic section	
15	GNDX	–	Ground terminal for oscillator output section	
16	XI	I	Crystal oscillator input Generates clock necessary for the system. 384fs	
17	XO	O		
18	VDX	–	Power input for oscillator output	
19	MCK	O	System clock output terminal 384fs	
20	EM1	I	44.1 kHz/32 kHz/48 kHz mode select terminal for deemphasis filter EM1: L / L / H / H EM2: L / H / H / L Mode: 44.1 kHz / 32 kHz / 48 kHz	
21	EM2	I		
22	R/L	I	R/L select terminal "H" : LRCK signal ("H" : R channel data input, "L" : L channel data input) "L" : LRCK signal ("H" : L channel data input, "L" : R channel data input)	Pull-up
23	EMP	I	Deemphasis filter ON/OFF select terminal "H" : ON, "L" : OFF	
24	$\overline{HS}$	I	Normal/high speed select terminal "H" : normal operation, "L" : high speed	
25	DATA	I	Data input terminal	
26	BCK	I	Bit clock input terminal	
27	LRCK	I	LR clock input terminal	
28	VDD	–	Power input for logic section	

10. PANEL FACILITIES



FRONT PANEL

① POWER switch (■ STANDBY/▬ ON)

Press to turn power to the unit ON and STANDBY.

② DISC (I, II) trays

These are where the discs are set. When power is switched ON and OPEN/CLOSE button is pressed, the tray opens to the front. To close the tray, press the OPEN/CLOSE button, or lightly push the tray opens to the front.

③ OPEN/CLOSE buttons

Press when you wish to eject or load a disc. Each time the button is pressed, the tray is alternately opens and closes.

④ DISC SELECT buttons (DISC I, DISC II)

DISC I: Use to select DISC I for playback or programming.

DISC II: Use to select DISC II for playback or programming.

⑤ PAUSE button (▯▯)

Press to temporarily interrupt playback. When pressed again, the pause mode is cancelled and playback resumes.

⑥ PLAY button (▷)

Press to begin playback, and to cancel the pause mode.

⑦ RANDOM PLAY button

Press to begin random playback.

⑧ HI-LITE SCAN button

Every track of a CD is played back for 10 seconds, starting at a point one minute from the beginning of each song. To set a new starting time for HI-LITE SCAN, press the HI-LITE SCAN button at any desired point during playback of a track. This point will be set as the new starting time. After that, each track is played back for 10 seconds beginning at the new starting time.

⑨ TIME/CALENDAR button

This button selects the display mode of the indicator panel. Each time the button is pressed, the indication changes from TIME, REMAIN, to TOTAL in that order. (For details concerning the display contents, refer to the explanation about the indicators.) To switch between disc I and II calendar displays, hold the button depressed a bit longer. When using the COMPU PGM function, the program contents matching the tape length will be displayed.

⑩ REPEAT button

Press this button for repeat playback. Pressing the button once, twice, or three times will change the repeat mode from single track repeat, all tracks repeat, and repeat playback cancellation.

⑪ Display

⑫ PROGRAM button

Use to program a sequence of tracks.

- Press this button after selecting a desired disc and track with the DISC SELECT and Track SEARCH buttons. Tracks will be added in the program in the order in which they are specified.

⑬ COMPU PGM button

If this button is pressed for A.S.E.S. recording and the Manual/Track SEARCH buttons are used to designate the length (in minutes) of the recording tape, the CD player will automatically select and program the CD tracks to be recorded. The tracks will be selected for recording so that the empty portion remaining at the end of the tape will be as short as possible. For details regarding this function, consult the operating instructions for the amplifier used.

⑭ **STOP button (□)**

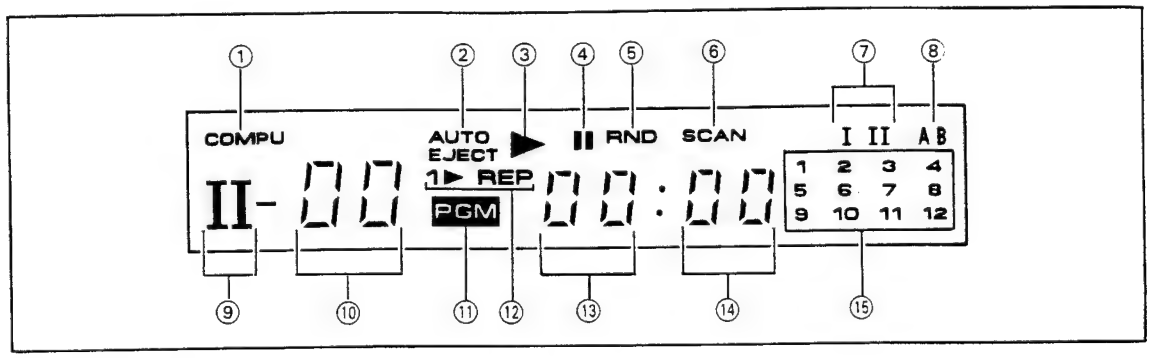
Press to stop playback. When pressed, the player goes into stop mode and all operations stop. Press to clear a program. When pressed during stop mode, the program stored in memory is cleared.

⑮ **Manual/Track SEARCH buttons**
(⏮ ◀◀, ▶▶ ⏭)

To perform track search in normal playback, programmed playback or PAUSE mode. You can advance to the next track or go back to the previous one by using the Manual/Track SEARCH buttons. The Fast forward or fast reverse function will be activated by holding down these buttons.

⑯ **AUTO EJECT button**

Press to perform auto eject playback.
When a disc is finished playing, the disc's disc tray will automatically open. The other disc tray will close and playback will start. By replacing discs, continuous playback can be maintained.



DISPLAY SECTION

① **COMPU:** Display when COMPU PGM editing is set or used.

② **AUTO EJECT:** Lights during auto eject playback.

③ **▶:** Lights during play.

④ **II:** Lights during temporarily interrupted playback.

⑤ **RND:** Lights during random playback.

⑥ **SCAN:** Lights during HI-LITE SCAN playback.

⑦ **I/II (music calendar):**
Only the numbers of the track recorded on DISC I (DISC II) will light. When inputing a program and when playing, only the programmed track number will light. The track will go out one by one or the tracks are played. Music calender changes DISC I to DISC II (DISC II to DISC I) by holding down TIME/CALENDAR button.

⑧ **A/B (music calendar):**
TAPE SIDE A/TAPE SIDE B
After editing, the track numbers that can be recorded on the A (B) side of the tape will light. **Music calender changes A to B (B to A) by holding down TIME/CALENDAR button.**

⑨ **I, II:** Displays the disc number (I or II) of the disc to be played.

⑩ **□□ (track):** Displays the current track number (during normal playback and programmed playback) or the track being programmed (during programming operation)

⑪ **PGM:** Lights after programming (after program has been memorized)

⑫ **1▶REP:** Light during repeat playback of one track (1▶ REP) and repeat play (REP)

⑬ **□□ (minutes):**
Displays the minutes of the elapsed time, total playback time, and remaining time.

⑭ **□□ (seconds):**
Displays the seconds of the elapsed time, total playback time, and remaining time.

⑬ and ⑭ change each time the TIME/CALENDAR button is pressed

- TIME: Displays the track number of the track being played (TRACK) and the elapsed time (minutes and seconds)
- REMAIN: Displays the remaining time on the track being played. When the TIME/CALENDAR button is pressed again, the remaining time on the disc being played will be displayed.
- TOTAL: Displays the total number of tracks on the disc (TRACK) and the overall playback time of disc II will be displayed. During playback, the display goes on for about 5 seconds before changing to the TIME display.

⑮ **1–12 (music calendar):**
Displays the track numbers. Normally, displays the track numbers for DISC I. To view the DISC II track number display, manually press the TIME/CALENDAR button (the unit will not switch to the DISC II display automatically).

11. SPECIFICATIONS

Type ..... Compact disc digital audio system
Discs used ..... Compact disc
Frequency response ..... 2 Hz—20 kHz
Channels ..... 2 (stereo)

Other

Dimensions ..... 260 (W) × 83.5 (H) × 253 (D) mm
Weight ..... 2.4 kg

Accessories

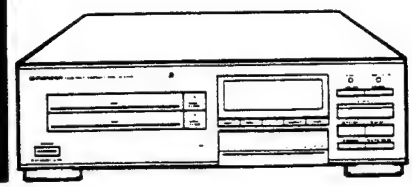
Operating instructions 1

NOTE:

The specifications and design of this product are subject to change without notice, due to improvements.

PIONEER
The Art of Entertainment

Service Manual



SERVICE GUID

ORDER NO

ARP214

TWIN-TRAY COMPACT DISC PLAYER

PD-Z74T

PIONEER ELECTRONIC CORPORATION 4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
PIONEER ELECTRONICS SERVICE INC. P.O. Box 1760, Long Beach, California 90801 U.S.A.
PIONEER ELECTRONICS OF CANADA, INC. 505 Cochrane Drive, Markham, Ontario L3R 8E3 Canada
PIONEER ELECTRONIC [EUROPE] N.V. Keetberglaan 1, 9120 Beveren, Belgium
PIONEER ELECTRONICS AUSTRALIA PTY. LTD. 178-184 Boundary Road, Braeside, Victoria 3195, Australia TEL: [03] 580-9911

SO MAR. 1991 Printed in Japan

DISASSEMBLY AND REASSEMBLY PROCEDURE OF TWIN MECHANISM

1. DISASSEMBLY

1.1 REMOVAL OF TRAY I

(1) Set the tray I to the OPEN position by pressing the OPEN/CLOSE button.

Note: When openning the tray I manually, insert a finger from the groove and rotate the idler gear in clockwise direction, shown in Fig. 1–1.

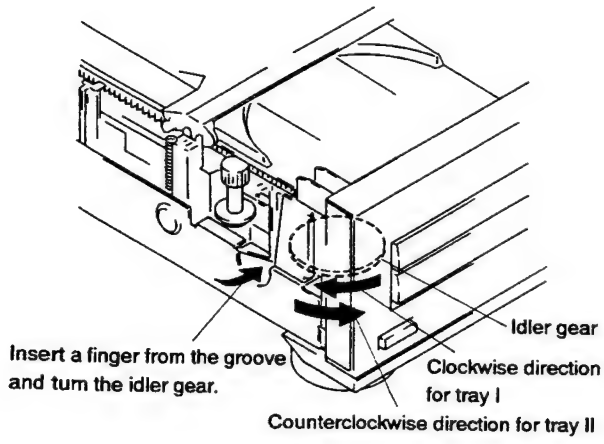


Fig. 1–1

(2) As shown in Fig. 1–2, insert a screw driver to the left slit of the tray I and pull out the tray in the direction of the arrow B, while the screw driver keeping to press in the direction of the arrow A.

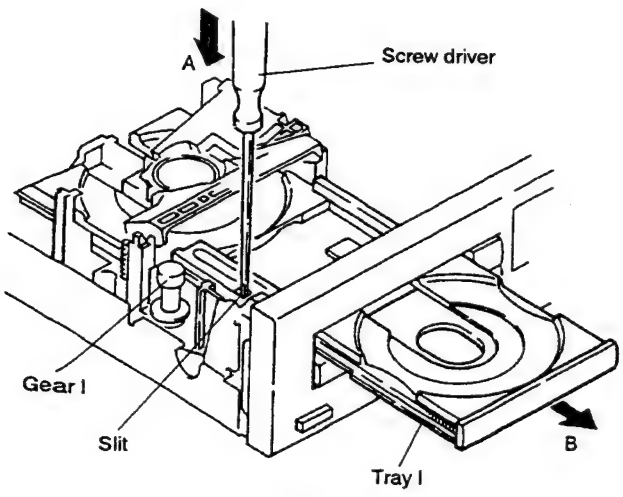


Fig. 1–2

1.2 REMOVAL OF TRAY II

(1) Set the tray II to the OPEN position by pressing the OPEN/CLOSE button.

Note: When openning the tray II manually, rotate the idler gear in the counterclockwise direction, shown in Fig. 1–1.

(2) As shown in Fig. 1–3, insert a screw driver to the right slit of the tray II and pull out the tray in the direction of the arrow B, while the screw driver keeping to press in the direction of the arrow A.

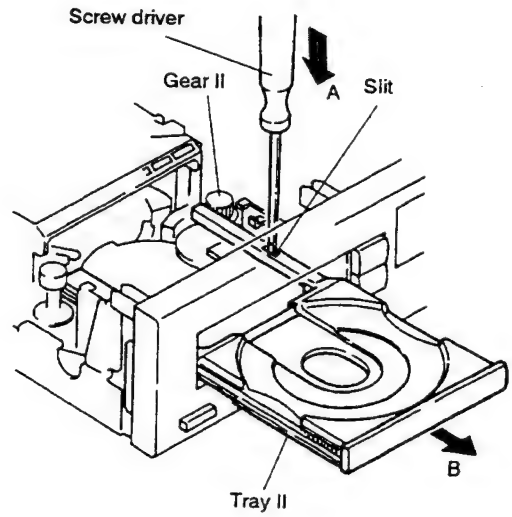


Fig. 1–3

1.3 REMOVAL OF CLAMPER ARM U AND B

(1) As shown in Fig. 1–4, rotate the idler gear so that the clamper assembly not to be clamped on the disc table. Next, take out the clamp sprig and the screw Ⓐ, and remove the clamper arm U and B.

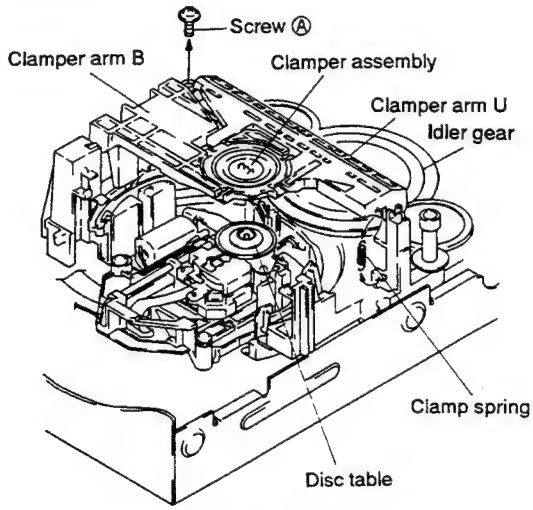


Fig. 1–4

1.4 REMOVAL OF SERVO MECHANISM ASSEMBLY

(1) Remove the tray I. (Refer to 1.1, REMOVAL OF TRAY I)
(2) Remove the tray II. (Refer to 1.2, REMOVAL OF TRAY II)
(3) Remove the clamper arm U and B. (Refer to 1.3, REMOVAL OF CLAMPER ARM U AND B)
(4) Remove four screws holding the servo mechanism assembly.

Note: As shown in Fig. 1–5, lead wires from the servo mechanism assembly are fixed by two hooks and a binder on the back of the twin tray mechanism section.

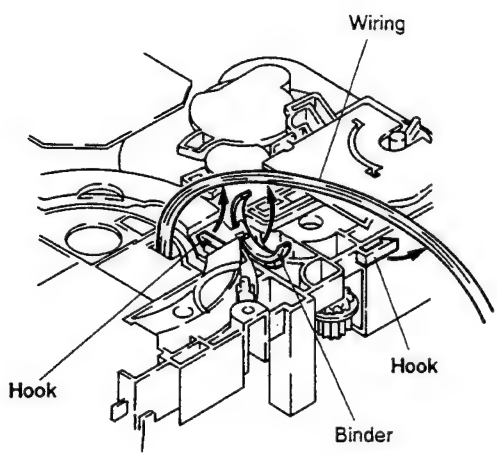


Fig. 1–5

1.5 REMOVAL OF LOADING BELT AND LOADING MOTOR

(1) Remove the tray I. (Refer to 1.1, REMOVAL OF TRAY I)
(2) Set the tray II to the OPEN position. (Refer to 1.2, REMOVAL OF TRAY II (1))
(3) Remove the belt and two screws Ⓑ, shown in Fig. 1–6.

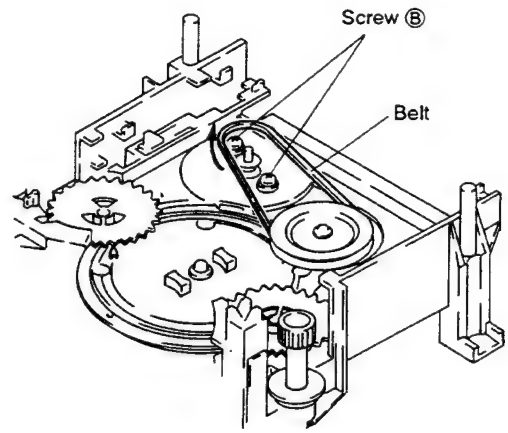


Fig. 1–6

(4) Set the tray II to the Close position.
(5) Remove screws holding the twin tray mechanism, and take out the twin tray mechanism from the body.
(6) Turn over the twin tray mechanism to set the position as shown in Fig. 1–7.
(7) Remove a screw Ⓒ holding the mechanism PCB assembly.
(8) Hold the A section of the mechanism PCB assembly and lift it up to the direction of the arrow, and remove the loading motor accompanied with the mechanism PCB assembly.

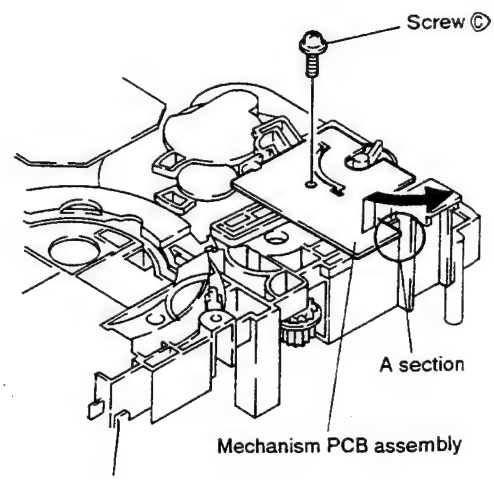


Fig. 1–7

2. REASSEMBLY

2.1 ASSEMBLY OF CLAMPER CAM AND FLOATING BASE

(1) As shown in Fig. 2–1, adjust the notches (3 points) in the clamper cam to the claws (3 points) of the loading base, and set the clamper cam to the position as the arrow shows.

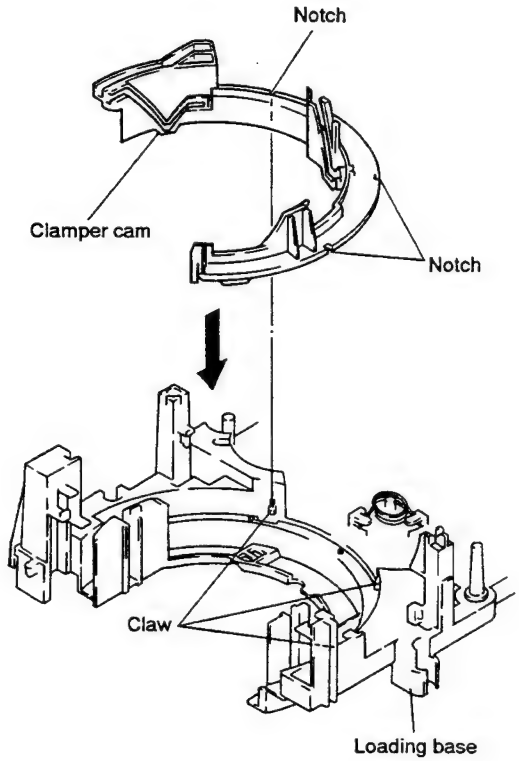


Fig. 2–1

(2) After adjusting the notches in the clamper cam to the claws (3 points) showing in Fig. 2–1, place the protrusions of the floating base on the grooves (2 points) of loading base as the arrow shows in Fig. 2–2.

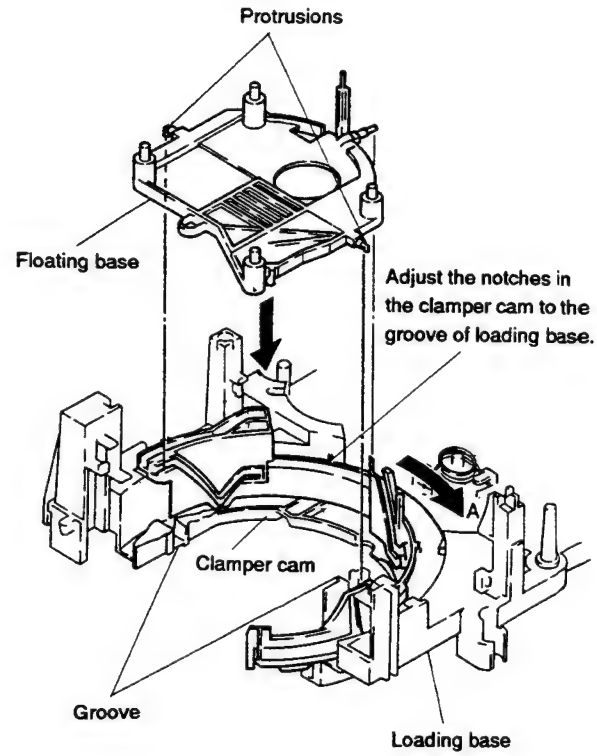


Fig. 2–2

(3) Rotate the clamper cam in the direction of the arrow A, and stop the rotation when the floating base reaches to the lowest position.

Note: Keep the floating base to the lowest position till the assembling of the main cam, follow gear, gear I, gear II, clamper arm U and B is completed.

2.2 ASSEMBLY OF MAIN CAM, FOLLOW GEAR, GEAR I, GEAR II AND GEAR PULLEY

(1) As shown in Fig. 2-3, attach the main cam, trying to adjust the main cam hole A to the clamper cam protrusion. Next, hold it with screw Ⓓ.

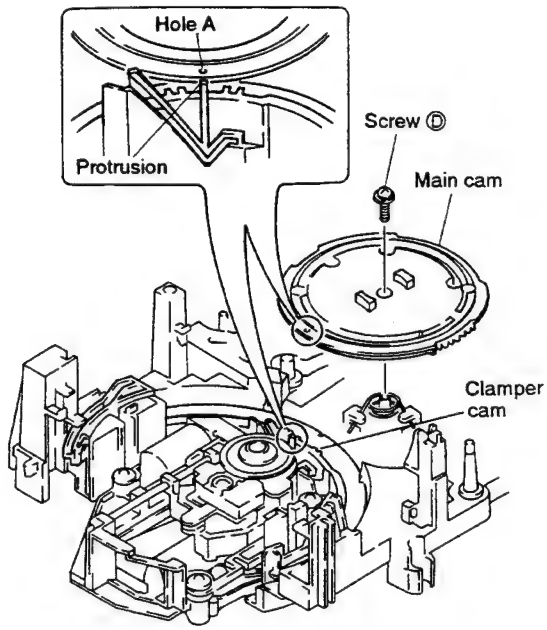


Fig. 2-3

(2) As shown in Fig. 2-4, after adjusting ♡ marks (2 points) on the main cam to the same marks on the two follow gears, insert them into the section A and B respectively.

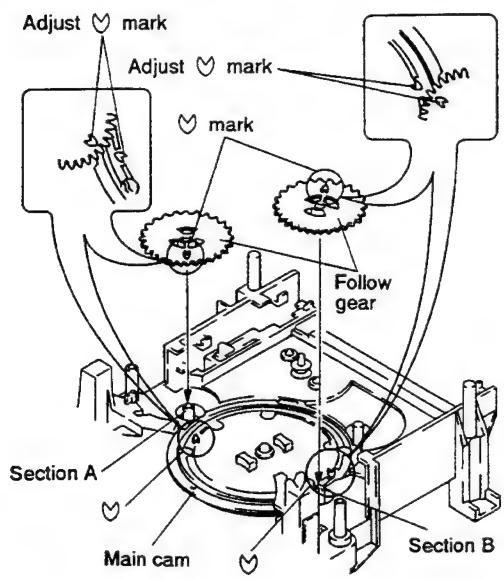


Fig. 2-4

(3) As shown in Fig. 2-5, adjust ⌂ mark on the gear I and the gear II to the hole ⌂ on follow gears, insert to positions shown in Fig., and hold them with two screws Ⓔ respectively.

(4) Insert the gear pulley to the position shown in Fig., and hold with the screw Ⓕ.

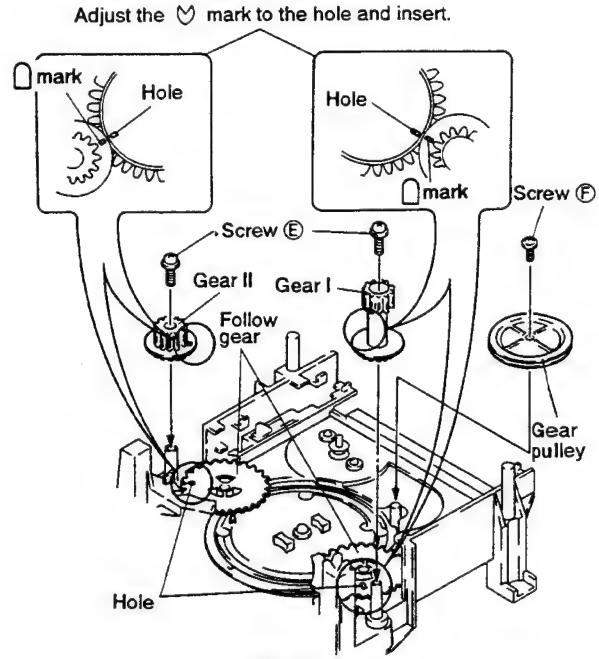


Fig. 2-5-1

(5) Finally, each gear position should be as follows.

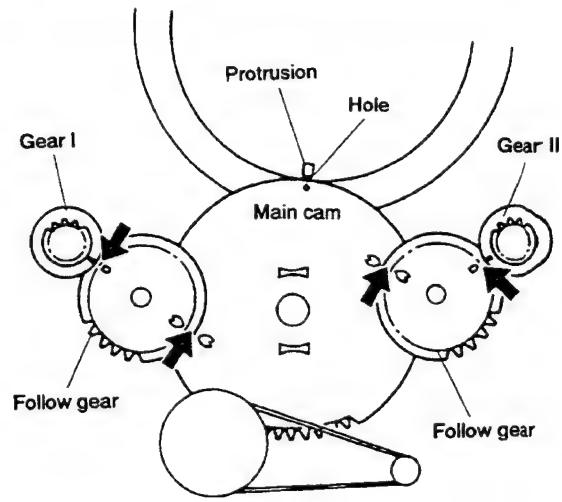


Fig. 2-5-2

2.3 ASSEMBLY OF CLAMPER ARM B, CLAMPER ARM U AND CLAMPER ASSEMBLY

(1) As shown in Fig. 2–6, insert the protrusion A of the clamper arm B into the groove of the loading base, and insert the protrusion C into the groove on the loading base, while the protrusion B being inserted into the groove on the clamper cam.

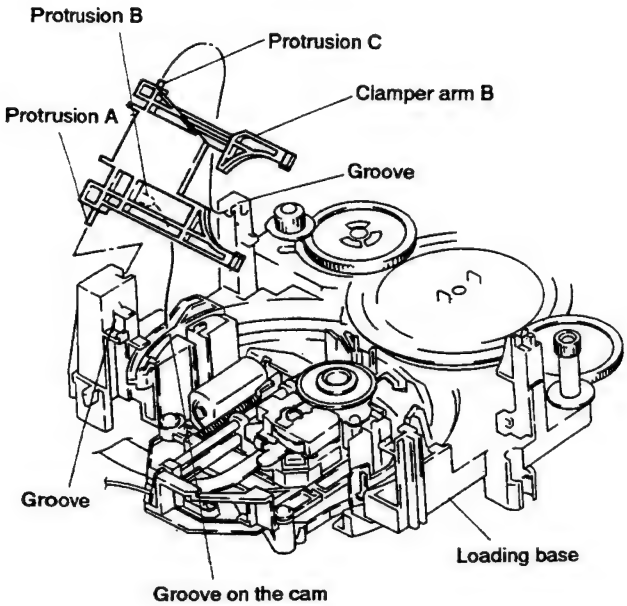


Fig. 2–6

(2) As shown in Fig. 2–7, attach the clamper assembly to the clamper arm B so that the protrusion D of the clamper assembly may turn to the position as Fig. shows.

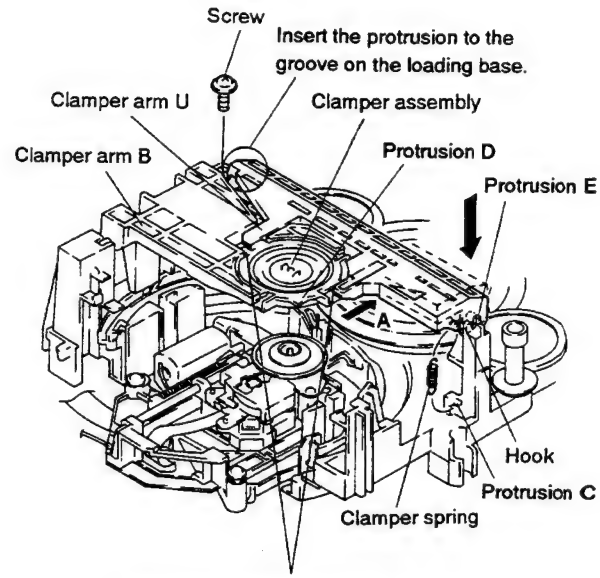


Fig. 2–7

(3) As shown in Fig. 2–7, insert the protrusion of the clamper arm U to the groove on the clamper assembly, and slide in the direction of the arrow A. Next, insert the protrusion of the clamper arm U to the groove on the loading base, while the protrusion E being pushed into the hook of the loading base.

2.4 ASSEMBLY OF LOADING MOTOR

(1) Press down the motor pulley toward the upper surface of the loading motor, keeping the space of 3 mm between the motor pulley and the upper surface of the loading motor.

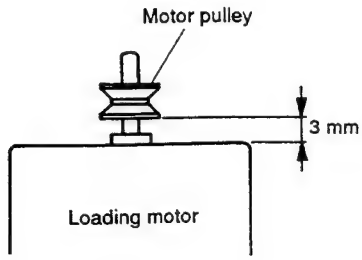


Fig. 2–8

(2) Solder the terminals of the loading motor to the mechanism PCB assembly. Since the loading motor has polarity, the positional relation between the label of the motor and the mechanism PCB assembly is shown in Fig. 2–9.

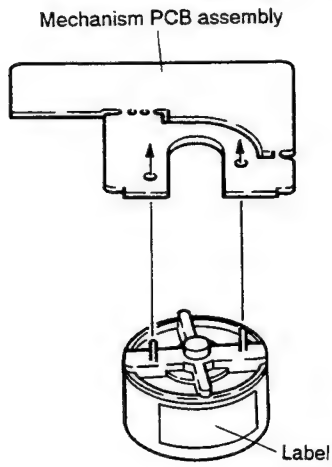


Fig. 2–9

(3) As shown in Fig. 2–10, after turning over the loading base, insert section A into the section B as the arrow shows, and fix with the screw Ⓖ.

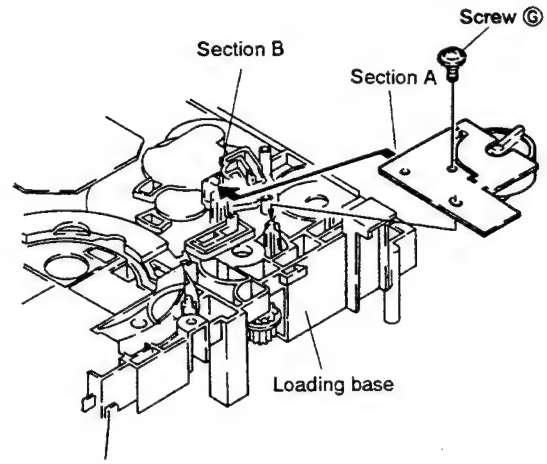


Fig. 2–10

(4) Turn over the loading base once again, and tighten the loading motor with two screws Ⓑ and set the belt as shown in Fig. 2–11.

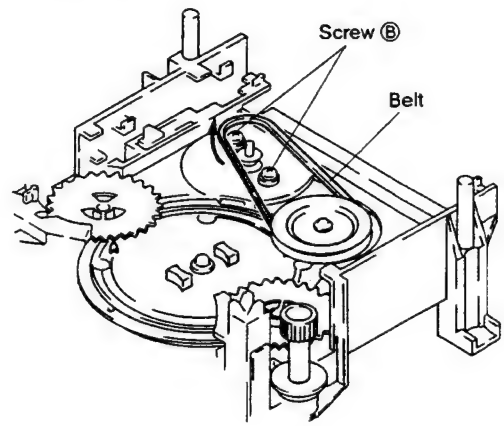


Fig. 2–11

2.5 ASSEMBLY TRAY I AND TRAY II

(1) As shown in Fig. 2–12, attach the lock lever and the lever spring to the sub tray (the two same forms), which must be placed to the left hand of the sub tray, if the sub tray is attached with the tray I, and which must be placed to the right hand of it, if it is attached with the tray II, looking from the front of the sub tray.

Note: Two lock levers are the same forms.

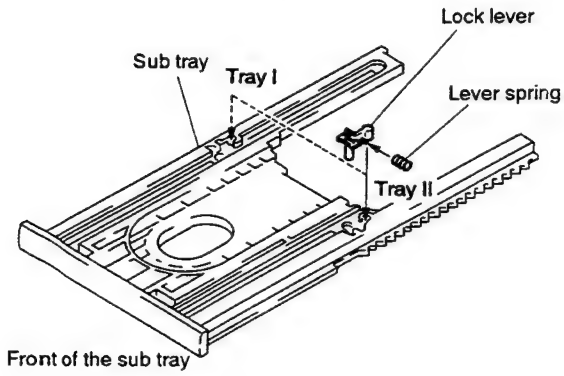


Fig. 2–12

(2) As shown in Fig. 2–13, attach the tray I or II to the sub tray by the hook applied to the section A. At that time note that the tray I has the gear on the left hand, and the tray II has the gear on the right hand. When attaching respectively, make sure the position where the lock lever attached.

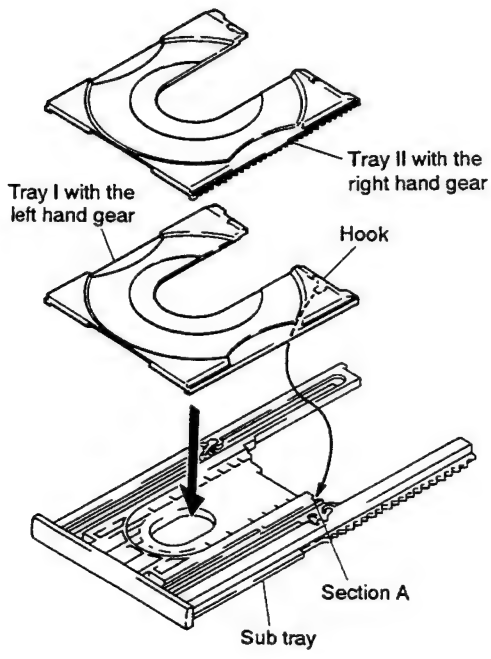


Fig. 2–13

(3) As shown in Fig. 2–14, turn over the tray, and put three screws Ⓗ on it.

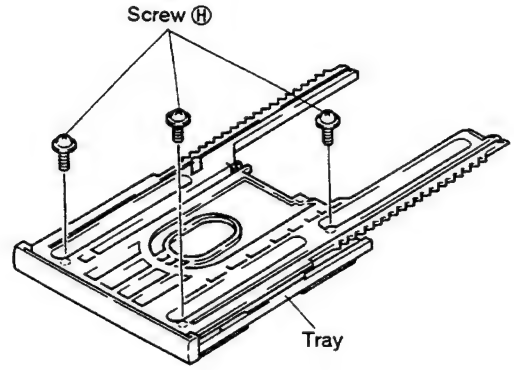


Fig. 2–14

2.6 ATTACHMENT OF TRAY II

(1) Press the OPEN/CLOSE button to make the tray I is in clamp condition, and the tray II is in open condition.

Note 1: When opening the tray II manually, insert a finger into the groove shown in Fig. 2–15, and fully rotate the idler gear counterclockwise. (As for the idler gear, refer to Fig. 1–1)

Note 2: Tray I should be attached after tray II's attachment has been completed.

(2) As shown in Fig. 2–15, adjust the □ mark on the gear II to the first tooth of the tray II, then push in the tray II slowly.

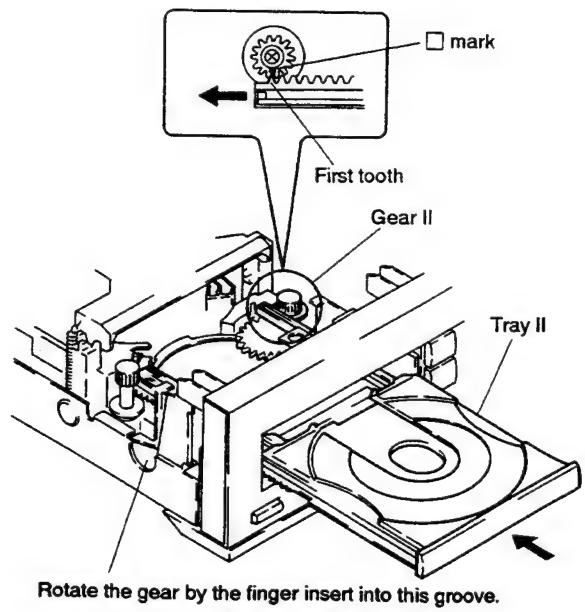


Fig. 2–15

2.7 ATTACHMENT OF TRAY I

(1) Press the OPEN/CLOSE button to make the disc II is in clamp condition, and the tray I is in open condition.

Note: When opening the tray I manually, insert a finger into the groove shown in Fig. 2–15, and rotate the idler gear clockwise, and tray II is clamped.
Further, rotate the idler gear, the pin pressing the switch appears at B position.When the pin moves to A position, stop the gear rotation. The gear I reaches to a position shown in the figure. At this position, attach the tray I.

(2) As shown in Fig. 2–16, adjust the first tooth of the tray I to the clogged part of the gear I, then push in the tray I slowly.

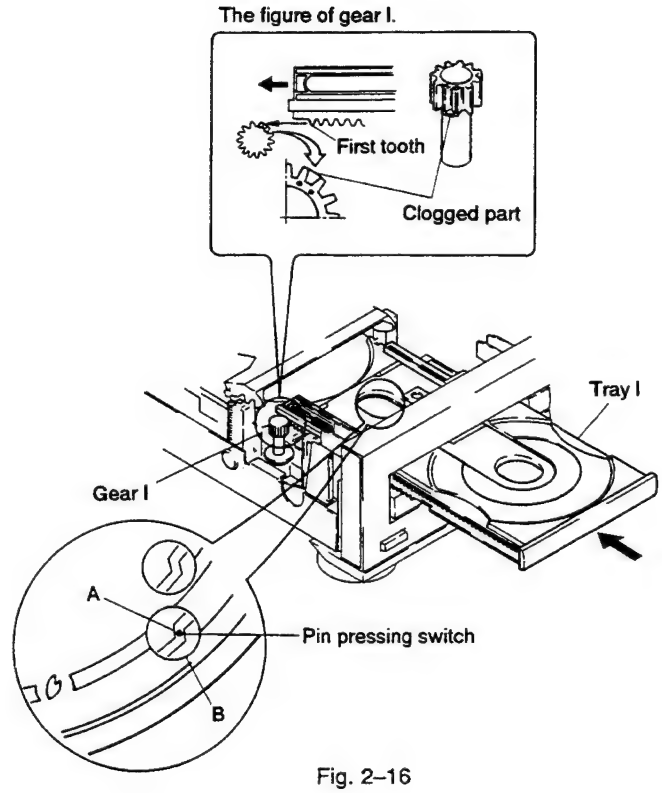


Fig. 2–16

2.8 STYLING

(1) Bend the wires as shown in Fig. 2–17.

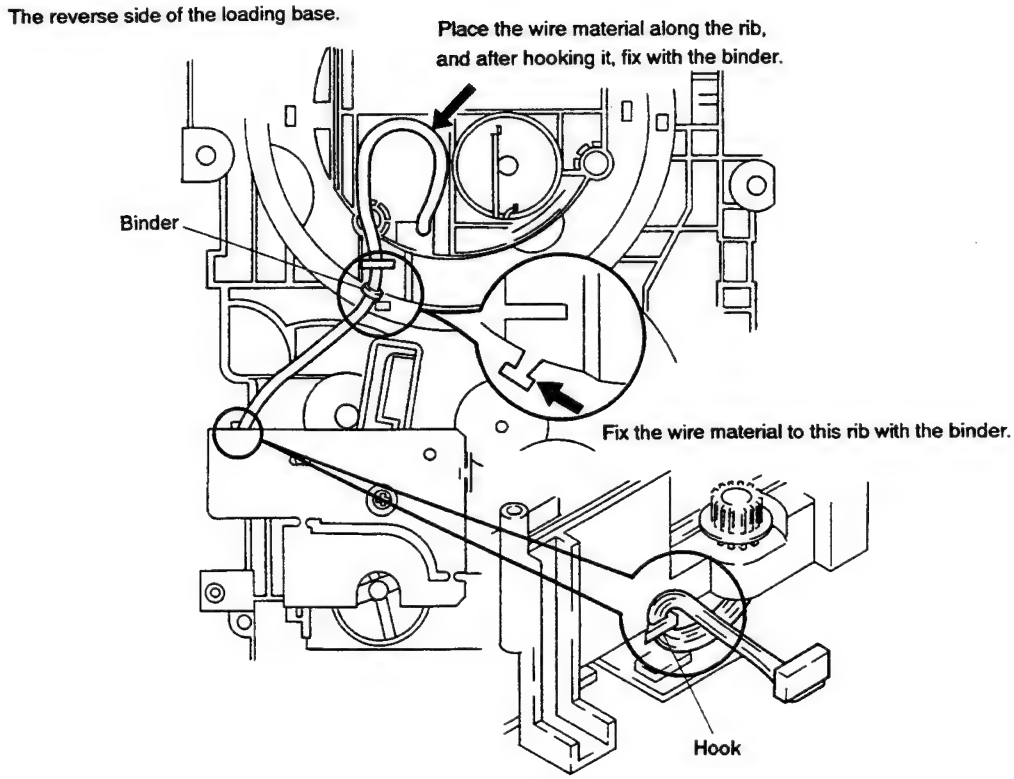


Fig. 2–17

3. OPERATION OUTLINE

3.1 CHARACTERISTICS

The twin–tray mechanism of this unit is characterized by two basic features.
The first one is that both trays are driven by only one loading motor like in conventional single–tray system. This is a continuation of the design thought underlying the last generation twin–tray mechanism.
The second feature is the sandwiched tray design together with the utilization of a vertically moving servo mechanism for clamping, and horizontally arranged parts, resulting in a simplified construction and reducing the depth and width of the mechanism. As a result, the dimensions of the tray mechanism are almost the same size as for conventional single–tray system.
In addition, the mechanism is suited for mini–sized (260 mm width) products.

3.2 STRUCTURE OF THE TRAY SECTION

The tray section consists of a tray and a sub tray, as shown in Fig. 3–1. The tray slides in the sub tray grooves and is secured by three screws.
The switching between tray and sub tray operation is performed via a lock lever mounted on the sub tray.

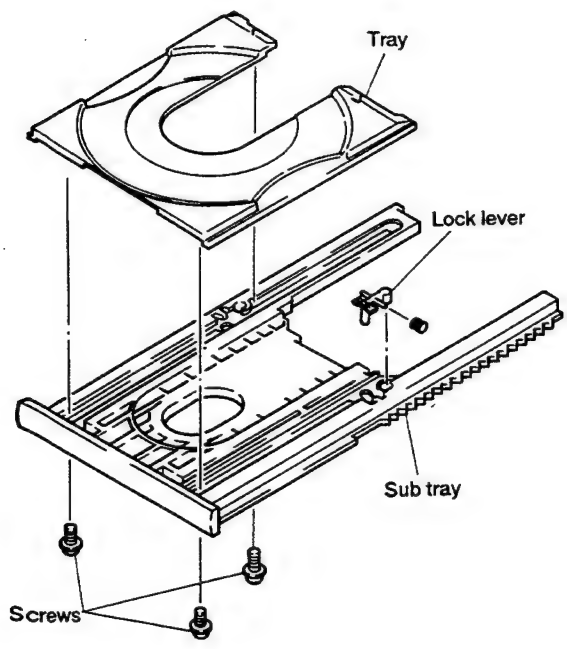


Fig. 3–1

As shown in Fig. 3–2, while the tray is opening or closing, the lock lever is held in the guide rib notch portion of the sub tray by the force of the lever spring, so that tray and sub tray move as one unit.

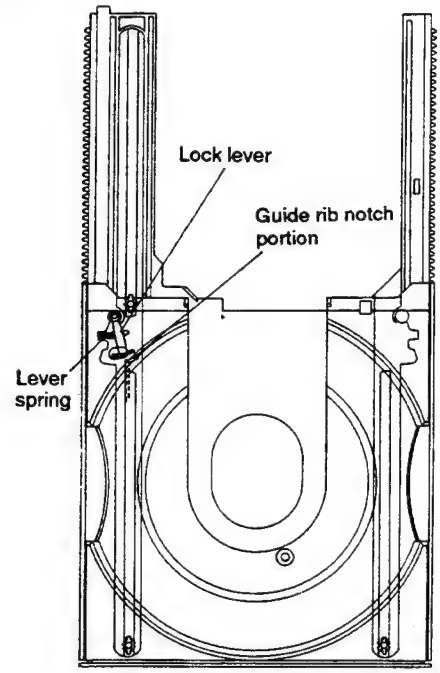


Fig. 3–2

When the tray is closed, the lock lever is disengaged from the guide rib notch of the sub tray by way of the guide groove in the loading base, and the interlocking between tray and sub tray is released.

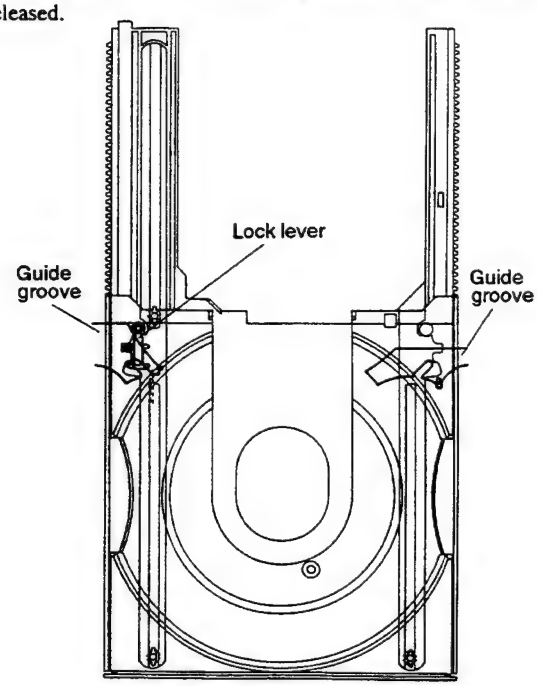


Fig. 3–3

When CHANGE or PLAY button is depressed, only the tray moves on the sub tray, as shown in Fig. 3–4. The driving gear for tray I is located on the left side of the tray and the lock lever is mounted on the left side of the sub tray. The driving gear and the lock lever for tray II are located on the right side.

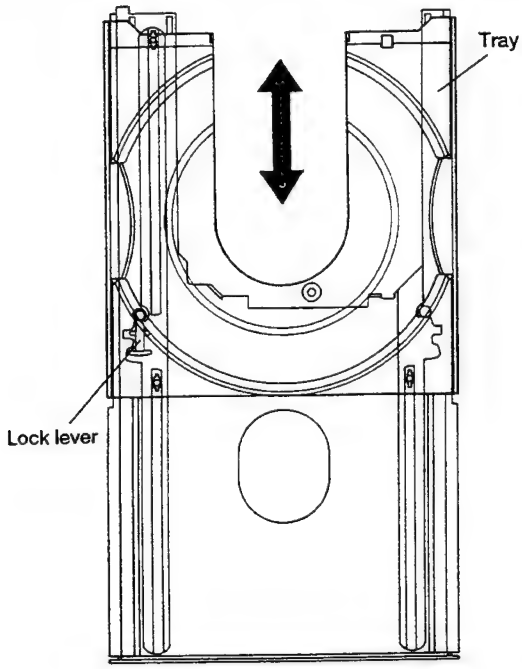


Fig. 3–4

3.3 POWER TRANSMISSION FROM THE LOADING MOTOR

As shown in Fig. 3–5, the rotation of the loading motor is transmitted to the main gear via a rubber belt, gear pulley, and idler gear.
The follow gears located on both side of the main gear are synchronized with the rotation of the main gear and rotate gear I and gear II respectively. Gears I and II drive the two trays.

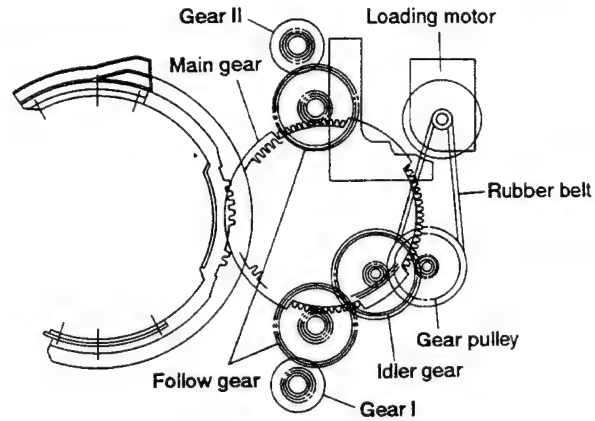


Fig. 3–5

As shown in Fig. 3–6, the drive power of the tray is transmitted by gears I and II to the gear section on the side of the sub tray and the tray. When the OPEN button is depressed, only the sub tray side is engaged, changing over to the tray side half-way between tray OPEN position and tray CLOSE position and then driving only the tray side to perform operation switching by the lock lever.

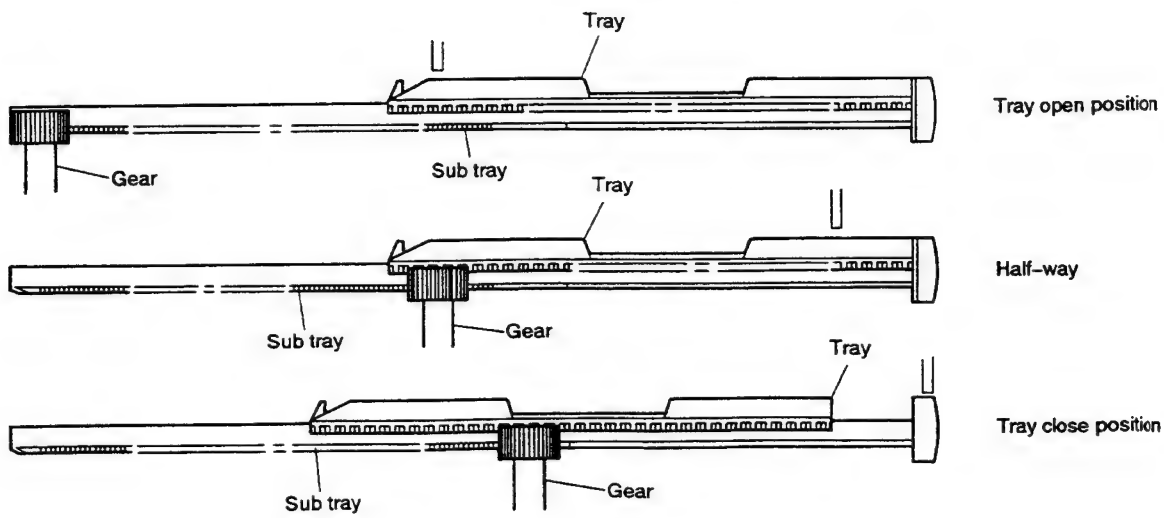


Fig. 3–6

The clamp cam, as shown in Fig. 3–7, rotates in synchronization with the main cam rotation to move the float base vertically. The cam groove of the clamp cam drives clamper arm B which, together with clamper arm U and the clamper holder, moves the clamper assembly up and down. (Refer to Fig. 1–4)

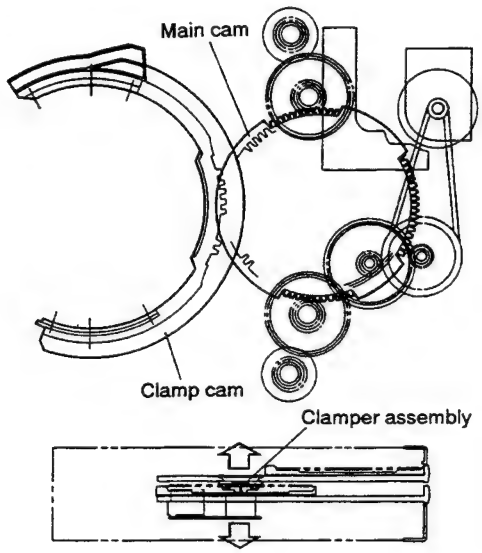


Fig. 3–7

3.4 TRAY POSITION DETECTION

The mechanism for tray position detection is shown in Fig. 3–8. The tray position is detected by the tips of three plastic springs, which are located on the loading base to follow the change of diameter in two grooves on the rear side of the main cam, and the ON/OFF condition of three switches located on the mechanism board.

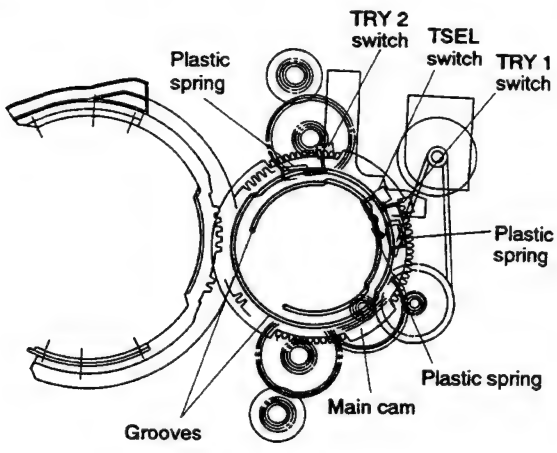


Fig. 3–8

3.5 MAIN CAM OPERATION

The main cam performs switching between operations.

(1) OPEN/CLOSE Operation

The two follow gears are located on the left and the right side of the main cam respectively. The left follow gear drives tray I via gear I and the right follow gear drives tray II via gear II.

As shown in Fig. 3–9, when tray I is in OPEN position, the left follow gear is engaged with the main cam gear. The non–toothed sections of the right follow gear and the main cam face each other, and the follow gear does not rotate. Therefore, when the motor rotates to tray I CLOSE direction (main cam rotates counterclockwise), only the left follow gear is driven to tray I to CLOSE direction. At this time, tray II is in the PLAY position.

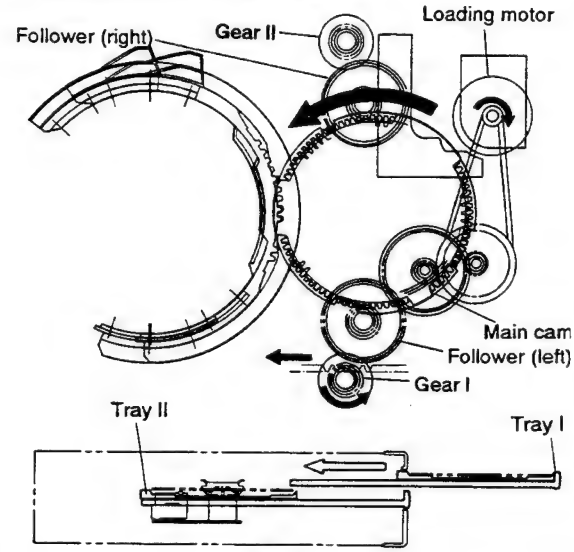


Fig. 3–9

		TRAY1	TRAY2	TRY1 switch	TSEL switch	TRY2 switch	Remarks
MECHANISM POSITION	①	OPEN	PLAY	L	H	L	When tray 2 is in play position, indicates that tray 1 has arrived in open position from close position.
	②	OPEN/ CLOSE	PLAY	H	H	L	When tray 2 is in play position, indicates that tray 1 is between close position and open position.
	③	CLOSE	PLAY	H	L	L	When tray 2 is in play position, indicates that tray 1 is at close position.
	④	CHANGE	CHANGE	H	L	H	When there is transition from ⑤ to ⑤, indicates that there is movement in progress with tray 1 to play position and tray 2 to close position. When there is transition from ⑤ to ④, indicates that there is movement in progress with tray 1 to close position and tray 2 to play position.
	⑤	CHANGE	CHANGE	H	H	H	
	⑥	PLAY	CLOSE	L	H	H	Indicates that tray 1 is in play position and tray 2 in close position.
	⑦	PLAY	OPEN/ CLOSE	L	L	H	When tray 1 is in play position, indicates that tray 2 is between close position and open position.
	⑧	PLAY	OPEN	L	L	L	When tray 1 is in play position, indicates that tray 2 has arrived in open position.

As shown in Fig. 3–10, when tray I is in CLOSE position, the non–toothed sections of the main cam and the left follow gear face each other, so that the follow gear does not rotate. At this time, the right follow gear is still positioned at the non–toothed section of the main cam so that tray II remains in PLAY position. OPEN/CLOSE operation of tray II is performed by reversing the above operation.

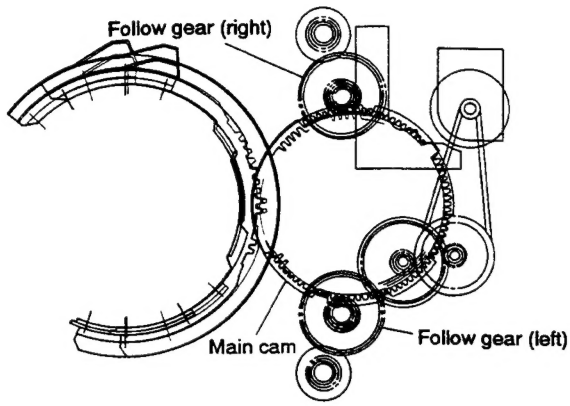


Fig. 3–10

(2) DISC Change Operation

As shown in Fig. 3–11, when tray I is in CLOSE position and tray II is in PLAY position, the follow gears (right and left) do not rotate as described above. At this time, the single tooth of the main cam and the 2–tooth of the clamp cam will be engaged and the clamp cam starts to rotate.

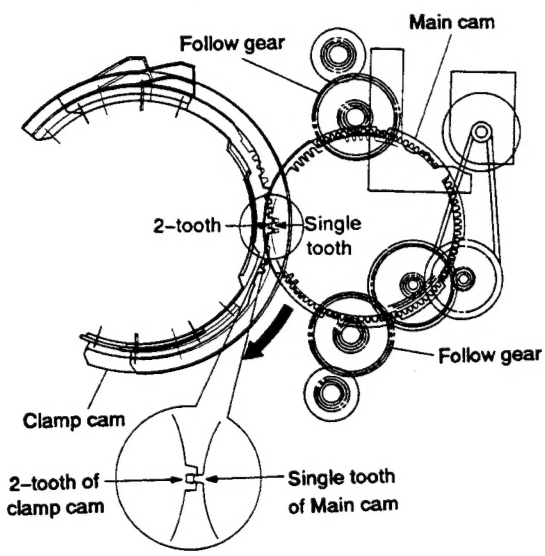


Fig. 3–11

When the main cam rotates counterclockwise as shown in Fig. 3–12, the clamp cam also rotates synchronously. The float base supported by the loading base guide moves down along the three V–shaped cams of the clamp cam. At the same time, the clamper arm moves along the groove on the right side of the clamp cam to raise the clamper assembly. By this operation the DISC clamp is released.

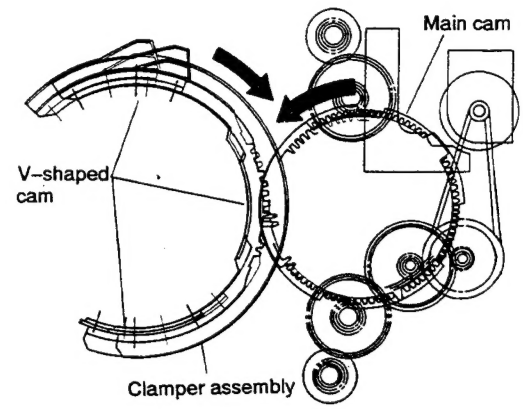


Fig. 3–12

When the main cam rotates further as shown in Fig. 3–13, the float base moves to the valley of the V–shaped cam and the gear section of the main cam and the follow gears are engaged. The follow gears (right and left) simultaneously rotate in clockwise direction. Driven by the follow gears, gears I and II rotate and simultaneously move tray I from the CLOSE position to the PLAY position and tray II from the PLAY position to the CLOSE position.

By this operation the DISC is changed. At this time, the non–toothed sections of the clamp cam and the main cam face each other so that the cams do not rotate.

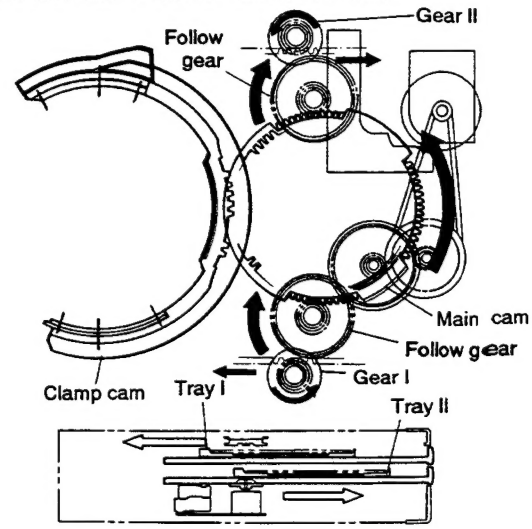


Fig. 3–13

As shown in Fig. 3–14, the second level gear of the main cam and the clamp cam gear engage just before the movements of tray I and tray II are completed, and the clamp cam starts to rotate again. The right and left follow gears face the non–toothed sections of the main cam, and at the same time the rotation stops.

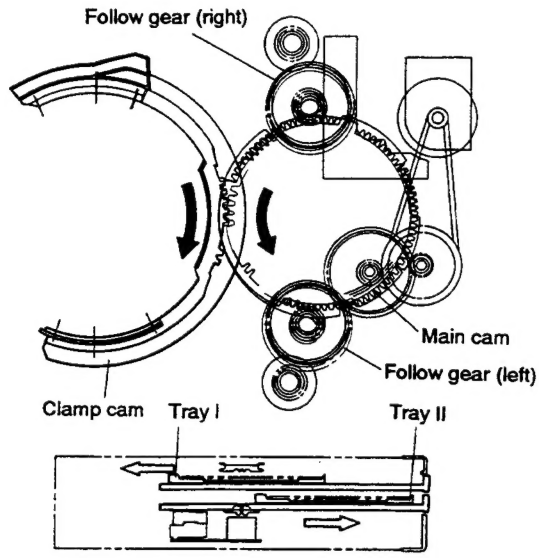


Fig. 3–14

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